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Madder,
Madeira.

rope. On the coast of Coromandel it has the name of *chat*, and grows wild on the coast of Malabar. The cultivated kind is imported from Vaour and Tucorin, but the most esteemed is the Persian chat called also *dumas*. Another plant, called *raye de chaye*, or colour-root, is also gathered on the coast of Coromandel; but this, though supposed to be a species of madder, is a kind of *galium flore albo*, which, however, gives a tolerable good colour to cotton. Another species of madder, called *chive-boya*, and *chine-bazala*, is cultivated at Kunder in the neighbourhood of Smyrna, and some other countries of Turkey in Asia. It is more esteemed than the best Zealand madder imported into these parts by the Dutch; and experiments have shown that it is superior to any other kind as a dyeing ingredient. The modern Greeks call this kind of madder *lizari*, and the Arabs *fonoy*. The fine colour of these madders, however, are by our author attributed to their being dried in the air, and not in stoves. Another kind of madder is produced in Canada, where it is called *tyssa-voyana*; its qualities are nearly the same with the European kind.

The root of madder impregnates water with a dull red colour, and spirit of wine with a deep bright red. This root, when eat by animals along with their food, tinges their urine, and their most solid bones, of a deep red. Wool previously boiled in a solution of alum and tartar, receives from a hot decoction of madder and tartar a very durable but not a very beautiful red colour. Mr Margraaf (Berlin Mem. 1771), shows how a very durable lake of a fine red colour, fit for the purposes of painting, may be obtained from madder. This process is as follows: Take two ounces of the purest Roman alum, and dissolve it in three French quarts of distilled water that has boiled, and in a clean glazed pot. Set the pot on the fire; and when the water begins to boil, withdraw it, and add two ounces of the best Dutch madder. Boil the mixture once or twice; then remove it from the fire, and filter it through a double filter of paper not coloured. Let the liquor thus filtrated stand a night to settle, and pour off the clear liquor into the glazed pot previously well cleaned. Make the liquor hot, and add to it gradually a clear solution of salt of tartar in water, till all the madder is precipitated. Filtrate the mixture; and upon the red precipitate which remains upon the filter pour boiling distilled water, till the water no longer acquires a saline taste. The red lake is then to be gently dried. No other water, neither rain nor river water, produces so good a colour as that which has been distilled, and the quantity required of this is considerable. The colour of the above precipitate is deep; but if two parts of madder be used to one part of alum, the colour will be still deeper: one part of madder and four parts of alum produces a beautiful rose colour.

MADEIRAS, a cluster of islands situated in the Atlantic ocean in W. Long. 16°, and between 32° and 33° N. Lat.—The largest of them, called *Madeira*, from which the rest take their name, is about 55 English miles long, and 10 miles broad; and was first discovered on the 2d of July, in the year 1419, by Joao Gonzales Zarco, there being no historical foundation for the fabulous report of its discovery by one Machin an Englishman. It is divided into two capi-

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tanias, named *Funchal* and *Maxico*, from the towns of those names. The former contains two judicatures, viz. Funchal and Calhetta; the latter being a town with the title of a county, belonging to the family of Castello Melhor. The second capitania likewise comprehends two judicatures, viz. Maxico (read Mahico) and San Vicente.

Funchal is the only cidade or city in this island, which has also seven villas or towns; of which there are four, Calhetta, Camara de Lobos, Ribeira Braba, and Ponta de Sol in the capitania of Funchal, which is divided into 26 parishes. The other three are in the capitania of Maxico, which consists of 17 parishes; these towns are called *Maxico*, *San Vicente*, and *Santa Cruz*.

The governor is at the head of all the civil and military departments of this island, of Porto-Santo, the Salvages, and the Ilhas Defartas; which last only contain the temporary huts of some fishermen, who resort thither in pursuit of their business.

The law-department is under the corregidor, who is appointed by the king of Portugal, commonly sent from Lisbon, and holds his place during the king's pleasure. All causes come to him from inferior courts by appeal. Each judicature has a senate; and a *Juiz* or judge, whom they choose, presides over them. At Funchal he is called *Juiz da Fora*; and in the absence, or after the death of the corregidor, acts as his deputy. The foreign merchants elect their own judges, called the *Providor*, who is at the same time collector of the king's customs and revenues, which amount in all to about 12,000 l. Sterling. Far the greatest part of this sum is applied towards the salaries of civil and military officers, the pay of troops, and the maintenance of public buildings. This revenue arises, first from the tenth of all the produce of this island belonging to the king, by virtue of his office as grand master of the order of Christ; secondly, from ten per cent. duties laid on all imports, provisions excepted; and lastly, from the eleven per cent. charged on all exports.

The island has but one company of regular soldiers of 100 men: the rest of the military force is a militia consisting of 3000 men, divided into companies, each commanded by a captain, who has one lieutenant under him and one ensign. There is no pay given to either the private men or the officers of this militia; and yet their places are much sought after, on account of the rank which they communicate. These troops are embodied once a-year, and exercised once a-month. All the military are commanded by the *Serjeante Mór*. The governor has two *Capitanos de Sal* about him, who do duty as aides-de-camp.

The secular priests on the island are about 1200, many of whom are employed as private tutors. Since the expulsion of the Jesuits, no regular public school is to be found here; unless we except a seminary, where a priest, appointed for that purpose, instructs and educates ten students at the king's expence. These wear a red cloak over the usual black gowns worn by ordinary students. All those who intend to go into orders, are obliged to qualify themselves by studying in the university of Coimbra, lately re-established in Portugal. There is also a dean and chapter at Madeira, with a bishop at their head, whose

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income

Madeiras. income is considerably greater than the governor's; it consists of 110 pipes of wine, and of 40 muids of wheat, each containing 24 bushels; which amounts in common years to 3000 l. Sterling. Here are likewise 60 or 70 Franciscan friars, in four monasteries, one of which is at Funchal. About 300 nuns live on the island, in four convents, of the order of Merci, Sta. Clara, Incarnacao, and Bom Jesus. Those of the last mentioned institution may marry whenever they choose, and leave their monastery.

In the year 1768, the inhabitants living in the 43 parishes of Madeira, amounted to 63,913, of whom there were 31,341 males and 32,572 females. But in that year 5243 persons died, and no more than 2198 children were born; so that the number of the dead exceeded that of the born by 3045. It is highly probable that some epidemical distemper carried off so disproportionate a number in that year, as the island would shortly be entirely depopulated if the mortality were always equal to this. Another circumstance concurs to strengthen this supposition, namely, the excellence of the climate. The weather is in general mild and temperate: in summer, the heat is very moderate on the higher parts of the island, whither the better sort of people retire for that season; and in the winter the snow remains there for several days, whilst it is never known to continue above a day or two in the lower parts.

The common people of this island are of a tawney colour, and well shaped; though they have large feet, owing perhaps to the efforts they are obliged to make in climbing the craggy paths of this mountainous country. Their faces are oblong, their eyes dark; their black hair naturally falls in ringlets, and begins to crisp in some individuals, which may perhaps be owing to intermarriages with negroes; in general, they are hard-featured, but not disagreeable. Their women are too frequently ill-favoured, and want the florid complexion, which, when united to a pleasing assemblage of regular features, gives our northern fair ones the superiority over all their sex. They are small, have prominent cheek-bones, large feet, an ungraceful gait, and the colour of the darkest brunette. The just proportion of the body, the fine form of their hands, and their large, lively eyes, seem in some measure to compensate for those defects. The labouring men, in summer, wear linen trowsers, a coarse shirt, a large hat, and boots; some have a short jacket made of cloth, and a long cloak, which they sometimes carry over their arm. The women wear a petticoat, and a short corselet or jacket, closely fitting their shapes, which is a simple, and often not an elegant dress. They have also a short, but wide cloak; and those that are unmarried tie their hair on the crown of their head, on which they wear no covering.

The country people are exceeding sober and frugal; their diet in general consisting of bread and onions, or other roots, and little animal-food. However, they avoid eating tripe, or any offals, because it is proverbially said of a very poor man, "He is reduced to eat tripe." Their common drink is water, or an infusion of the remaining rind or skin of the grape (after it has passed through the wine-press), which when fermented acquires some tartness and acidity, but

cannot be kept very long. The wine for which the **Madeiras.** island is so famous, and which their own hands prepare, seldom if ever regales them.

Their principal occupation is the planting and raising of vines; but as that branch of agriculture requires little attendance during the greatest part of the year, they naturally incline to idleness. The warmth of the climate, which renders great provision against the inclemencies of weather unnecessary, and the ease with which the cravings of appetite are satisfied, must tend to indolence, wherever the regulations of the legislature do not counteract it, by endeavouring, with the prospect of increasing happiness, to infuse the spirit of industry. It seems the Portuguese government does not pursue the proper methods against this dangerous lethargy of the state. They have lately ordered the plantation of olive trees here, on such spots as are too dry and barren to bear vines; but they have not thought of giving temporary assistance to the labourers, and have offered no premium by which these might be induced to conquer their reluctance to innovations and aversion to labour.

The vineyards are held only on an annual tenure, and the farmer reaps but four-tenths of the produce, since four other tenths are paid in kind to the owner of the land, one tenth to the king, and one to the clergy. Such small profits, joined to the thought of toiling merely for the advantage of others, if improvements were attempted, entirely preclude the hopes of a future increase. Oppressed as they are, they have however preserved a high degree of cheerfulness and contentment; their labours are commonly alleviated with songs, and in the evening they assemble from different cottages to dance to the drowsy music of a guitar.

The inhabitants of the towns are more ill-favoured than the country-people, and often pale and lean. The men wear French clothes, commonly black, which do not seem to fit them, and have been in fashion in the polite world about half a century ago. Their ladies are delicate, and have agreeable features: but the characteristic jealousy of the men still locks them up, and deprives them of a happiness which the country-women, amidst all their distresses, enjoy. Many of the better people are a sort of *petite noblesse*, which we would call *gentry*, whose genealogical pride makes them unsociable and ignorant, and causes a ridiculous affectation of gravity. The landed property is in the hands of a few ancient families, who live at Funchal, and in the various towns on the island.

Madeira consists of one large mountain, whose branches rise every-where from the sea towards the centre of the island, converging to the summit, in the midst of which is a depression or excavation, called the *Val* by the inhabitants, always covered with a fresh and delicate herbage. The stones on the island seem to have been in the fire, are full of holes, and of a blackish colour; in short, the greater part of them are lava. A few of them are of the kind which the Derbyshire miners call *dunstone*. The soil of the whole island is a tarras mixed with some particles of clay, lime, and sand, and has much the same appearance as some earths on the isle of Ascension. From this circumstance, and from the excavation of the summit of the mountain, it is probable, that in some remote period

Madeira. a volcano has produced the lava and the ochreous particles, and that the Val was formerly its crater.

Many brooks and small rivulets descend from the summits in deep chasms or glens, which separate the various parts of the island. The beds of the brooks are in some places covered with stones of all sizes, carried down from the higher parts by the violence of winter-rains or floods of melted snow. The water is conducted by weirs and channels in the vineyards, where each proprietor has the use of it for a certain time; some being allowed to keep a constant supply of it, some to use it thrice, others twice, and others only once a-week. As the heat of the climate renders this supply of water to the vineyards absolutely necessary, it is not without great expence that a new vineyard can be planted; for the maintenance of which, the owners must purchase water at a high price, from those who are constantly supplied, and are thus enabled to spare some of it.

Wherever a level piece of ground can be contrived in the higher hills, the natives make plantations of eddoes enclosed by a kind of dike to cause a stagnation, as that plant succeeds best in swampy ground. Its leaves serve as food for hogs, and the country-people use the roots for their own nourishment.

The sweet potatoe is planted for the same purpose, and makes a principal article of diet; together with chesnuts, which grow in extensive woods, on the higher parts of the island, where the vine will not thrive. Wheat and barley are likewise sown, especially in spots where the vines are decaying through age, or where they are newly planted. But the crops do not produce above three months provisions; and the inhabitants are therefore obliged to have recourse to other food, besides importing considerable quantities of corn from North America in exchange for wine. The want of manure, and the inactivity of the people, are in some measure the causes of this disadvantage; but supposing husbandry to be carried to its perfection here, they could not raise corn sufficient for their consumption. They make their threshing-floors of a circular form, in a corner of a field, which is cleared and beaten solid for the purpose. The sheaves are laid round about it; and a square board, stuck full of sharp flints below, is dragged over them by a pair of oxen, the driver getting on it to increase its weight. This machine cuts the straw as if it had been chopped, and frees the grain from the husk, from which it is afterwards separated.

The great produce of Madeira is the wine, from which it has acquired fame and support. Where the soil, exposure, and supply of water, will admit of it, the vine is cultivated. One or more walks, about a yard or two wide, intersect each vineyard, and are included by stone-walls two feet high. Along these walks, which are arched over with laths about seven feet high, they erect wooden pillars at regular distances, to support a lattice-work of bamboos, which slopes down from both sides of the walk, till it is only a foot and a half or two feet high, in which elevation it extends over the whole vineyard. The vines are in this manner supported from the ground, and the people have room to root out the weeds which spring up between them. In the season of the vintage, they

creep under this lattice-work, cut off the grapes, *Madeira*. and lay them into baskets: some bunches of these grapes weigh six pounds and upwards. This method of keeping the ground clean and moist, and ripening the grapes in the shade, contributes to give the Madeira wines that excellent flavour and body for which they are remarkable. The owners of vineyards are however obliged to allot a certain spot of ground for the growth of bamboos; for the lattice work cannot be made without them; and it is said some vineyards lie quite neglected for want of this useful reed.

The wines are not all of equal goodness, and consequently of different prices. The best, made of a vine imported from Candia by order of the Infante of Portugal, Don Henry, is called *Madeira Malmsey*, a pipe of which cannot be bought on the spot for less than 40 or 42 l. Sterling. It is an exceeding rich sweet wine, and is only made in a small quantity. The next sort is a dry wine, such as is exported for the London market, at 30 or 31 l. Sterling the pipe. Inferior sorts for the East India, West India, and North American markets, sell at 28, 25, and 20 l. Sterling. About 30,000 pipes, upon a mean, are made every year, each containing 110 gallons. About 13,000 pipes of the better sorts are exported; and all the rest is made into brandy for the Brazils, converted into vinegar, or consumed at home.

The inclosures of the vineyards consist of walls, and hedges of prickly pear, pomegranates, myrtles, brambles, and wild roses. The gardens produce peaches, apricots, quinces, apples, pears, walnuts, chesnuts, and many other European fruits; together with now and then some tropical plants, such as bananas, goavas, and pine-apples.

All the common domestic animals of Europe are likewise found at Madeira; and their mutton and beef, though small, is very well tasted. Their horses are small, but sure-footed; and with great agility climb the difficult paths, which are the only means of communication in the country. They have no wheel-carriages of any kind; but in the town they use a sort of drays or sledges, formed of two pieces of plank joined by cross pieces, which make an acute angle before; these are drawn by oxen, and are used to transport casks of wine, and other heavy goods, to and from the warehouses.

The animals of the feathered tribe, which live wild here, are more numerous than the wild quadrupeds; there being only the common grey rabbit here, as a representative of the last-mentioned class. Tame birds, such as turkies, geese, ducks, and hens, are very rare, which is perhaps owing to the scarcity of corn.

There are no snakes whatsoever in Madeira; but all the houses, vineyards, and gardens, swarm with lizards. The friars of one of the convents complained to Mr Forster, that these vermin destroyed the fruit in their garden; they had therefore placed a brass-kettle in the ground to catch them, as they are constantly running about in quest of food. In this manner they daily caught hundreds, which could not get out on account of the smooth sides of the kettle, but were forced to perish.

The shores of Madeira, and of the neighbouring Salvages and Desertas, are not without fish; but as they are not in plenty enough for the rigid observance

Madian of Lent, pickled herrings are brought from Gottenburg in English bottoms, and salted cod from New York and other American ports, to supply the deficiency.

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Madrepora

MADIAN, (anc. geog.) a town of Arabia Petraea, near the Arnan; so called from one of the sons of Abraham by Ketura, in ruins in Jerome's time. Jerome mentions another MADIAN, or MIDIAN, beyond Arabia, in the desert, to the south of the Red Sea: and hence *Madianæi*, and *Madianitæi*, the people; and *Madianæa Regio*, the country.

MADNESS, a most dreadful kind of delirium, without fever. See (the *Index* subjoined to) MEDICINE.

MADOX (Dr Isaac), an ingenious and worthy prelate, born of obscure parents about the year 1696, who placed him apprentice to a pastry-cook; but not relishing this employment, and having an inclination to learning, he was put to school by some friends, and completed his studies at Aberdeen. He entered into orders; and having the good fortune to be made chaplain to Dr Bradford bishop of Chichester, he married his niece, a very sensible and worthy lady. From this time his preferment may be dated; he was made king's chaplain, clerk of the closet to queen Caroline, and about the year 1736 bishop of St Asaph; from whence, in 1743, he was translated to Worcester. He was an excellent preacher, and a great promoter of public charities; particularly the Worcester infirmary, and the hospital for inoculating the small-pox at London: his sermon in favour of this latter institution, preached in 1752, was much admired, and contributed greatly to extend the practice of inoculation. He published some other single sermons, and a Defence of the Doctrine and Discipline of the Church of England, in answer to Mr Neale's History of the Puritans.—Dr Madox died in 1759.

MADRAS. See *St GEORGE*.

MADRE DE POPA, a town and convent of South America, in Terra Firma, seated on the river Grande. It is almost as much resorted to by pilgrims of America as Loretto is in Europe; and the image of the Virgin Mary is said to have done many miracles in favour of the sea-faring people. W. Lon. 76. 0. N. Lat. 11. 0.

MADREPORA, in natural history, the name of a genus of submarine substances; the characters of which are, That they are almost of a stony hardness, resembling the corals, and are usually divided into branches, and pervious by many holes or cavities, which are frequently of a stellar figure.

In the Linnæan system, this is a genus of lithophyta: The animal that inhabits it is the Medusa; it comprehends 39 species. According to Donati, the madrepora is like the coral as to its hardness, which is equal to bone or marble; the colour is white when polished; its surface is lightly wrinkled, and the wrinkles run lengthwise of the branches; in the centre there is a sort of cylinder, which is often pierced thro' its whole length by two or three holes. From this cylinder are detached about 17 laminæ, which run to the circumference in straight lines; and are transversely intersected by other laminæ, forming many irregular cavities; the cellules, which are composed of these laminæ ranged into a circle, are the habitations of little polypes, which are extremely tender animals, generally

transparent, and variegated with beautiful colours. Madrepora, M. de Peyssonel observes, that those writers who only considered the figures of submarine substances, denominated that class of them, which seemed pierced with holes, *póra*; and those, the holes of which were large, they called *madrepóra*. He defines them to be all those marine bodies which are of a stony substance, without either bark or crust, and which have but one apparent opening at each extremity, furnished with rays that proceed from the centre to the circumference. He observes that the body of the animal of the madrepora, whose flesh is so soft that it divides upon the gentlest touch, fills the centre; the head is placed in the middle, and surrounded by several feet or claws, which fill the intervals of the partitions observed in this substance, and are at pleasure brought to its head, and are furnished with yellow papillæ. He discovered that its head or centre was lifted up occasionally above the surface, and often contracted and dilated itself like the pupil of the eye: he saw all its claws moved, as well as its head or centre. When the animals of the madrepora are destroyed, its extremities become white. In the madrepora, he says, the animal occupies the extremity; and the substance is of a stony but more loose texture than the coral. This is formed, like other substances of the same nature, of a liquor which the animal discharges; and he farther adds, that there are some species of the polype of the madrepora which are produced singly, and others in clusters.

MADRID, a town of New Castile in Spain, and capital of the whole kingdom, though it never had the title of a city, is situated in W. Long. 3. 5. N. Lat. 40. 26. It stands in the centre of a large plain, surrounded with mountains, and in the very heart of Spain, on the banks of the little river Manzanares, which is always very low and shallow, except when it is swelled by the melting of the snow on the mountains. The city is in general well laid out; the streets are very handsome; and the houses are fair and lofty, but built of brick, with lattice-windows, excepting those of the rich, who have glass in their windows; only, during the summer-heats, they use gauze, or some such thin stuff, instead of it, to let in the fresh air. There are two stately bridges here over the Manzanares, a great many magnificent churches, convents, hospitals, and palaces. The royal palace, which stands on the west side of the town, on an eminence, is spacious and magnificent, consisting of three courts, and commanding a fine prospect. At the east end of the town is the Prado, or pardo; which is a delightful plain, planted with regular rows of poplar trees, and watered with a great many fountains; where the nobility and gentry take the air on horseback, or in their coaches, and the common people on foot, or divert themselves with a variety of sports and exercises. Almost all the streets of Madrid are straight, wide, clean, and well paved. The largest and most frequented are the street of Alcalá, that of Atocha, that of Toledo, and the *Calle grande* or great street. Madrid has also several squares, which in general are not very regular. The principal are those of San Joachim, Sol, Lasganas, San Domingo, La Cevado, and the Plaza Mayor. The latter especially deserves notice for its spaciousness and regularity, and the elegant and lofty houses it contains. It is fifteen hundred and thirty-six feet in circuit.

Madrepora,
Mad: id.

Madrid. The houses, of which there are 136, are of five stories, ornamented with balconies; the first of which, supported by pillars, form a piazza round the square, where the inhabitants may walk under cover. In the middle of the square a market is kept.—The streets and squares of Madrid, except the Plaza Mayor which has been just described, are ornamented with fountains in a very ill taste. Those most to be distinguished in this particular are the fountain of the small irregular square called *Plaza di Antonio Martin*, and that of the square named *Puerta del Sol*. The others are not more magnificent though less ridiculous. The water of all these fountains is excellent; and the air of Madrid, though the weather be variable and uncertain, is extremely pure. It was this purity of the air and excellent quality of the water which induced Philip II. and his successors to fix their residence in this city. It is also well supplied with provisions of all kinds at reasonable rates; and the court, with the resort and residence of the quality, and the high colleges and offices that are kept here, occasion a brisk trade and circulation of money.

The sacred edifices in this city have nothing remarkable in their architecture: those of St Pasqual, St Isabella, and the Carmelites, contain highly valuable collections of pictures which may be seen with admiration even after the paintings of the Escorial and the new palace. The church of St Isidro, which heretofore belonged to the Jesuits, has a portal which has escaped the contagion of the age in which it was built. There is another church much more modern, which on account of its mass has a venerable appearance, but which true taste may justly disavow: it is that of St Salesas, or the visitation, founded by Ferdinand VI. and the queen Barbara his wife.—The convent of St Francis has already been some years building *, and there are hopes that it will become one of the finest productions of architecture in the capital.—Besides a variety of charitable foundations, there are here three confraternities, the revenues of which are appropriated to the succour of the wretched; and an institution similar to the *Mont de Pieté* in Paris, the principal object of which is to advance money to the necessitous.

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There are four academies in Madrid: The first is the Spanish academy founded in 1714, in imitation of the French academy, and consisting of 24 members, including the president. Its device is a crucible on

burning coals, with the motto *limpia, fixa, y da esplendor*; "it purifies, fixes, and gives lustre." Its first object was the compilation of a dictionary of the Spanish language, which was published in six volumes folio, and of which a new edition, with great additions, has been lately put to the press. The same academy is also employed on a superb edition of *Don Quixotte*, adorned with elegant engravings far superior to the last, and collated with all the former editions. The second is the academy of history; which owes its origin to a society of individuals, the object of whose meetings was to preserve and illustrate the historical monuments of the kingdom of Spain. Their labours met the approbation of Philip V. who in 1738 confirmed their statutes by a royal cedula. This academy consists of 24 members, including the president, secretary, and censor. Its device is a river at its source; and the motto, *In patriam populumque fluit*. The other two academies are the academy of the fine arts, painting, sculpture, and architecture; and the academy of medicine. The latter is held in no great esteem.

The environs of Madrid contain several royal seats; among which are El Buen Retiro, Casa del Campo, Florida, Le Pardo, Sarfuela, and St Ildefonso; but the most magnificent not only in this country but perhaps in the whole world is the Escorial, which takes its name from a small village, near which it stands, about 22 miles north-west from Madrid; and of which a description is given under the article ESCURIAL. Another royal palace, greatly admired particularly for its delicious gardens and surprising water-works, is Aranjuez, which is situated on the Tagus, about 30 miles south of Madrid. See ARANJUEZ.

MADRIGAL, a short amorous poem, composed of a number of free and unequal verses, neither confined to the regularity of a sonnet, nor to the point of an epigram; but only consisting of some tender and delicate thought, expressed with a beautiful, noble, and elegant simplicity.

Menage derives the word from *mandra*, which, in Latin and Greek, signifies "a sheep-fold;" imagining it to have been originally a kind of pastoral or shepherd's song; whence the Italians formed their *madrigale*, and we *madrigal*. Others rather choose to derive it from the word *madrugar*, which in the Spanish language signifies "to rise in the morning;" the *madrigales* being formerly sung early in the morning by those who had a mind to serenade their mistresses.

MADURA, a province of Asia, in the peninsula on this side the Ganges; bounded on the east by Tanjour and Marava, on the south-east by the sea, on the west by the Balagate mountains, which separate it from Malabar, and on the north by Visapour and Carnate. The inhabitants are Gentoos, and of a thievish disposition. The commodities are rice, elephants teeth, and cotton-cloth; of which last a great deal is made here, and very fine. The Dutch have a pearl-fishery, which brings them in a large sum annually.

MÆANDER (anc. geog.), a celebrated river of Asia Minor, rising near Celænæ. It flows through Caria and Ionia into the Ægean sea between Miletus and Priene, after it has been increased by the waters of the Marfyas, Lycus- Eudon, Lethæus, &c. It is cele.

Madrid
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Mæander.

• Bourgo-
anne's Tre-
vels in Spain
1789.

Mæatz.
Mæcenaz.

celebrated among the poets for its windings, which amount to not less than 600, and from which all obliquities have received the name of *mæanders*. It forms in its course, according to the observation of some travellers, the Greek letters ε ζ ε & ω; and from its windings Dædalus is said to have had the first idea of his famous labyrinth.

MÆATÆ, anciently a people of Britain, near Severus's wall, inhabiting the district now called *Lauderdale*, in Scotland.

MÆCENAS (Caius Cilnius), the great friend and counsellor of Augustus Cæsar, was himself a very polite scholar, but is chiefly memorable for having been the patron and protector of men of letters. He was descended from a most ancient and illustrious origin, even from the kings of Hetruria, as Horace often tells us; but his immediate forefathers were only of the equestrian order. He is supposed to have been born at Rome, because his family lived there; but in what year, antiquity does not tell us. It says as little about his education; but we know it must have been of the most liberal kind, and perfectly agreeable to the dignity and splendor of his birth, since he excelled in every thing that related to arms, politics, and letters. How Mæcenaz spent his younger years is also unknown to us, any farther than by effects; there being no mention made of him by any writer before the death of Julius Cæsar, which happened in the year of Rome 709. Then Octavius Cæsar, who was afterwards called *Augustus*, went to Rome, to take possession of his uncle's inheritance; and then Mæcenaz became first publicly known, though he appears to have been Augustus's intimate friend, and as it should seem guardian, from his childhood. From that time he accompanied him through all his fortunes, and was his counsellor and adviser upon all occasions; so that *Pedo Albino-vanus* justly called him *Cæsar's dextram*, "Cæsar's right-hand."

In A. R. 710, the year that Cicero was killed and Ovid born, Mæcenaz distinguished himself by his courage and military skill at the battle of Modena, where the consuls Hirtius and Panfa were slain in fighting against Antony; as he did afterwards at Philippi. After this last battle began the memorable friendship between Mæcenaz and Horace. Horace, as Suetonius relates, was a tribune in the army of Brutus and Cassius, and upon the defeat of those generals made a prisoner of war. Mæcenaz, finding him an accomplished man, became immediately his friend and protector; and afterwards recommended him to Augustus, who restored to him his estate with no small additions. In the mean time, though Mæcenaz behaved himself well as a soldier in these and other battles, yet his principal province was that of a minister and counsellor. He was the adviser, the manager, the negociator, in every thing that related to civil affairs. When the league was made at Brundisium between Antony and Augustus, Mæcenaz was sent to act on the part of Augustus. This we learn from Horace in his journey to Brundisium:

*Huc venturus erat Mæcenaz optimus, atque
Cocceius, missi magnis de rebus uterque
Legati, aversos soliti componere amicos.* Sat. v. l. i.

And afterwards, when this league was near breaking,

through the suspicions of each party, Mæcenaz was sent to Antony to ratify it anew.

In the year 717, when Augustus and Agrippa went to Sicily to fight Sextus Pompeius by sea, Mæcenaz went with them; but soon after returned, to appease some commotions which were rising at Rome: for though he usually attended Augustus in all his military expeditions, yet, whenever there was any thing to be done at Rome either with the senate or people, he was always dispatched thither for that purpose.

Upon the total defeat of Antony at Actium, Mæcenaz returned to Rome, to take the government into his hands, till Augustus could settle some necessary affairs in Greece and Asia. Agrippa soon followed Mæcenaz; and when Augustus arrived, he placed these two great men and faithful adherents, the one over his civil the other over his military concerns. While Augustus was extinguishing the remains of the civil war in Asia and Egypt, young Lepidus, the son of the triumvir, was forming a scheme to assassinate him at his return to Rome. This conspiracy was discovered at once, by the extraordinary vigilance of Mæcenaz; who, as Velleius Paterculus says, "observing the rash councils of the headstrong youth with the same tranquillity and calmness as if nothing at all had been doing, instantly put him to death, without the least noise and tumult; and by that means extinguished another civil war in its very beginning."

The civil wars being now at an end, Augustus returned to Rome; and from this time Mæcenaz indulged himself at vacant hours in literary amusements, and the conversation of men of letters. In the year 734 Virgil died, and left Augustus and Mæcenaz heirs to what he had. Mæcenaz was excessively fond of this poet, who, of all the wits of the Augustan age, stood highest in his esteem; and if the *Georgics* and the *Æneid* be owing to the good taste and encouragement of this patron, as there is some reason to think, posterity cannot commemorate him with too much gratitude. Horace may be ranked next to Virgil in Mæcenaz's good graces: we have already mentioned how and at what time their friendship commenced. Propertius also acknowledges Mæcenaz for his favourer and protector, lib. ii. eleg. 7. Nor must Varius be forgot, though we have nothing of his remaining; since we find him highly praised by both Virgil and Horace. He was a writer of tragedies; and Quintilian thinks he may be compared with any of the ancients. In a word, Mæcenaz's house was a place of refuge and welcome to all the learned of his time; not only to Virgil, Horace, Propertius, and Varius, but to Fundarius, whom Horace extols as an admirable writer of comedies; to Fuscus Aristius, a noble grammarian, and Horace's intimate friend; to Plotius Tucea, who assisted Varius in correcting the *Æneid* after the death of Virgil; to Valgius, a poet and very learned man, who, as Pliny tells us, dedicated a book to Augustus, *De usu Herbarum*; to Asinius Pollio, an excellent tragic writer; and to several others, whom it would be tedious to mention. All these dedicated their works, or some part of them at least, to Mæcenaz, and celebrated his praises in them over and over: and we may observe farther, what Plutarch tells us, that even Augustus himself inscribed his *Commentaries* to him and to Agrippa.

Mæcenaz

Mæcenas,
Maelstrom.

Mæcenas continued in Augustus's favour to the end of his life, but not uninterruptedly. Augustus had an intrigue with Mæcenas's wife: and though the minister bore this liberty of his master very patiently, yet there was a coldness on the part of Augustus, which, however, soon went off. Mæcenas died in the year 745; but at what age we cannot precisely determine, though we know he must have been old. He must have been older than Augustus, because he was a kind of tutor to him in his youth: and then find him often called *an old man* by Pædo Albinovanus, a contemporary poet, whose elegy upon his dead patron is still extant. He made Augustus his heir; and recommended his friend Horace to him in those memorable last words, "*Horatii Flacci, ut mei, memor esto, &c.*" Horace, however, did not probably survive him long, as there is no elegy of his upon Mæcenas extant, nor any account of one having ever been written, which there certainly would have been had Horace survived him any time. Nay, Father Sanadon, the French editor of Horace, will have it, that the poet died before his patron; and that these last words were found only in Mæcenas's will, which had not been altered.

Mæcenas is said never to have enjoyed a good state of health in any part of his life: and many singularities are related of his bodily constitution. Thus Pliny tells us, that he was always in a fever; and that, for three years before his death, he had not a moment's sleep. Though he was certainly an extraordinary man, and possessed many admirable virtues and qualities, yet it is agreed on all hands, that he was very luxurious and effeminate. "Mæcenas (says Velleius Paterculus) was of the equestrian order, but sprung from a most illustrious origin. He was a man, who, when business required, was able to undergo any fatigue and watching; who consulted properly upon all occasions, and knew as well how to execute what he had consulted; yet a man who in seasons of leisure was luxurious, soft, and effeminate, almost beyond a woman. He was no less dear to Cæsar than Agrippa, but distinguished by him with fewer honours; for he always continued of the equestrian rank, in which he was born: not that he could not have been advanced upon the least intimation, but he never solicited it."

But let moralists and politicians determine of Mæcenas as they please, the men of letters are under high obligations to celebrate his praises and revere his memory: for he countenanced, protected, and supported, as far as they wanted his support, all the wits and learned men of his time; and that too, out of a pure and disinterested love of letters, when he had no little views of policy to serve by their means: whence it is no wonder, that all the protectors and patrons of learning, ever since, have usually been called *Mæcenas's*.

MAELSTROM, a very dangerous whirlpool on the coast of Norway, in the 68th degree of latitude, in the province of Nordland, and the district of Lofoden, and near the island of Moskoe, from whence it also takes the name of *Moskoe-strom*. Its violence and roarings exceed that of a cataract, being heard to a great distance, and without any intermission, except a quarter every sixth hour, that is, at the turn of high and low water, when its impetuosity seems at a stand, which short interval is the only time the fishermen can venture in: but this motion soon returns, and, however calm the sea may be, gradually increases with such a

draught and vortex as absorb whatever comes within their sphere of action, and keep it under water for some hours, when the fragments, shivered by the rocks, appear again. This circumstance, among others, makes strongly against Kircher and others, who imagine that there is here an abyss penetrating the globe, and issuing in some very remote parts, which Kircher is so particular as to assign, for he names the gulph of Bothnia. But after the most exact researches which the circumstances will admit, this is but a conjecture without foundation; for this and three other vortices among the Ferroe islands, but smaller, have no other cause, than the collision of waves rising and falling, at the flux and reflux, against a ridge of rocks and shelves, which confine the water so that it precipitates itself like a cataract; and thus the higher the flood rises, the deeper must the fall be; and the natural result of this is a whirlpool or vortex, the prodigious suction whereof is sufficiently known by lesser experiments. But what has been thus absorbed, remains no longer at the bottom than the ebb lasts; for the suction then ceases, and the flood removes all attraction, and permits whatever had been sunk to make its appearance again. Of the situation of this amazing Moskoe-strom we have the following account from Mr Jonas Ramus, "The mountain of Helseggen, in Lofoden, lies a league from the island Ver, and betwixt these two runs that large and dreadful stream called *Moskoe-strom*, from the island Moskoe, which is in the middle of it, together with several circumjacent isles, as Ambaaren, half a quarter of a league northward, Islesen, Hoeholm, Kieldholm, Suarven, and Buckholm. Moskoe lies about half a quarter of a mile south of the island of Ver, and betwixt them these small islands, Otterholm, Flimen, Sandflesen, Stockholm. Betwixt Lofoden and Moskoe, the depth of the water is between 36 and 40 fathoms; but on the other side, towards Ver, the depth decreases so as not to afford a convenient passage for a vessel, without the risk of splitting on the rocks, which happens even in the calmest weather: when it is flood, the stream runs up the country between Lofoden and Moskoe with a boisterous rapidity; but the roar of its impetuous ebb to the sea is scarce equalled by the loudest and most dreadful cataracts; the noise being heard several leagues off, and the vortices or pits are of such an extent and depth, that if a ship comes within its attraction, it is inevitably absorbed and carried down to the bottom, and there beat to pieces against the rocks; and when the water relaxes, the fragments thereof are thrown up again. But these intervals of tranquillity are only at the turn of the ebb and flood, and calm weather: and last but a quarter of an hour, its violence gradually returning. When the stream is most boisterous, and its fury heightened by a storm, it is dangerous to come within a Norway mile of it; boats, ships, and yachts having been carried away, by not guarding against it before they were within its reach. It likewise happens frequently, that whales come too near the stream, and are overpowered by its violence; and then it is impossible to describe their howlings and bellowings in their fruitless struggles to disengage themselves. A bear once attempting to swim from Lofoden to Moskoe, with a design of preying upon the sheep at pasture in the island, afforded the like spectacle to the people; the stream caught him, and bore him down, whilst he

roared!

Mæmacte-
ria
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Mæstlin.

roared terribly, so as to be heard on shore. Large stocks of firs and pine trees, after being absorbed by the current, rise again, broken and torn to such a degree as if bristles grew on them. This plainly shows the bottom to consist of craggy rocks, among which they are whirled to and fro. This stream is regulated by the flux and reflux of the sea; it being constantly high and low water every six hours. In the year 1645, early in the morning of Sexagesima Sunday, it raged with such noise and impetuosity, that on the island of Moskoe, the very stones of the houses fell to the ground."

MÆMACTERIA, sacrifices offered to Jupiter at Athens in the winter month Mæmacterion. The god surnamed Mæmactes was intreated to send mild and temperate weather, as he presided over the seasons, and was the god of the air.

MÆMACTERION was the fourth month of the Athenian year, containing twenty-nine days, and answering to the latter part of our September, and the beginning of October. It received its name from the festival *Memaetia*, which was observed about this time. This month was called by the Bæotians *Alalcomenius*.

MÆNA, in ichthyology. See **SPARUS**.

MÆNALUS (anc. geog.) a mountain of Arcadia sacred to the god Pan, and greatly frequented by shepherds. It received its name from Mænalus a son of Lycaon. It was covered with pine trees, whose echo and shade have been greatly celebrated by all the ancient poets.

MÆONIA, or **MŒONIA**, a country of Asia Minor, and forming part of Lydia; namely the neighbourhood of mount Tmolus, and the country watered by the Pactolus. The rest on the sea-coast was called Lydia. See **LYDIA**.

MÆONIDÆ, a name given to the Muses, because Homer, their greatest and worthiest favourite, was supposed to be a native of Mæonia.

MÆONIDES, a surname of Homer, because, according to the opinion of some writers, he was born in Mæonia, or because his father's name was Mæon.

MÆOTIS PALUS or **LACUS**, *Mæotica Palus*, or *Mæoticus Lacus*, (anc. geog.), a large lake or part of the sea between Europe and Asia, at the north of the Euxine, to which it communicates by the Cimerian Bosphorus. It was worshipped as a deity by the Mæfagetæ. It extends about 390 miles from south-west to north-east, and is about 600 miles in circumference. Still called *Palus Mæotis*, reaching from Crim Tartary to the mouth of the Don.

MÆSTLIN (Michael), in Latin *Mæstlinus*, a celebrated astronomer of Germany, was born in the duchy of Wittemberg; but spent his youth in Italy, where he made a speech in favour of Copernicus's system, which brought Galilæo over from Aristotle and Ptolemy, to whom he had been hitherto entirely devoted. He afterwards returned to Germany, and became professor of mathematics at Tübingen; where, among his other scholars, he taught the great Kepler, who has praised several of his ingenious inventions, in his *Astronomia Optica*. Though Tycho Brahe did not assent to Mæstlin's opinion, yet he allowed him to be an extraordinary person deeply skilled in the science of astronomy. Mæstlin published many mathematical and astronomical works; and died in 1590.

Nº 191.

MÆSTRICHT, an ancient large, and strong town of the Netherlands, ceded to the Dutch by the treaty of Munster. The town-house and the other public buildings are handsome, and the place is about four miles in circumference, and strongly fortified. It is governed jointly by the Dutch and the bishop of Liege; however, it has a Dutch garrison. The inhabitants are noted for making excellent fire-arms, and some say that in the arsenal there are arms sufficient for a whole army. Both Papists and Protestants are allowed the free exercise of their religion, and the magistrates are composed of both. It is seated on the river Maese, which separates it from Wyck, and with which it communicates by a handsome bridge. Mæstricht revolted from the Spaniards in 1570, but was reduced in 1579. Louis XIV. became master of it in 1673; but it was restored to the states by the treaty of Nimeguen in 1678. E. Long. 5. 50. N. Lat. 51. 5.

MAFFÆUS (Vegio), a Latin poet, born in Lombardy in 1407, was greatly admired in his time. He wrote epigrams, and a humorous supplement to Virgil, which he called *The thirteenth book of the Æneid*: this was as humorously translated into English a few years since by Mr Ellis. Maffæus wrote also some prose works. He was chancellor of Rome towards the end of the pontificate of Martin V.; and died in 1458.

MAFFEI (Scipio), a celebrated Italian poet, born of an illustrious and ancient family at Verona, in 1675. After having finished his studies, he took arms, and distinguished himself by his valour at the battle of Donawert; but he more particularly distinguished himself by his love of learning, which made him undertake several voyages into France, England, and Germany. He conversed with the learned in all those countries, and obtained their friendship and esteem. He was a member of the academy of the Arcadia at Rome, an honorary foreign member of that of Inscriptions at Paris; and died in 1755. He wrote many works in verse and prose, which are esteemed; the most known of which are, 1. The tragedy of Merope, of which there are two French translations in prose. 2. Ceremony, a comedy. 3. A translation, into Italian verse, of the first book of Homer's Iliad. 4. Many other pieces of poetry, in a collection intitled *Rhyme and Prose*, quarto. His principal works in prose, are, 1. *Verona illustrata*. 2. *Istoria diplomatica*. 3. *Scienza cavalleresca*; an excellent work, in which he attacks duelling. 4. An edition of *Theatro Italiano*. 5. An edition of Cassiodorus on the Epistles, Acts of the Apostles, and Apocalypse. 6. *Gallia antiquitates quædam selectæ atque in plures epistolas distributæ*; and several other works.

MAGADA, in mythology, a title under which Venus was known and worshipped in Lower Saxony; where this goddess had a famous temple, which was treated with respect even by the Huns and Vandals when they ravaged the country. It is said to have been destroyed by Charlemagne.

MAGADOXO, the capital town of a kingdom of the same name, in Africa, and on the coast of Ajan. It is seated near the mouth of a river of the same name, defended by a citadel, and has a good harbour. The inhabitants are Mahometans. E. Long. 45. 15. N. Lat. 3. 0.

MAGAS,

Magas, **MAGAS**, **MAGADIS**, (from *μαγαδίζειν* "to sing or play in unison or octave,") the name of a musical instrument in use among the ancients.

There were two kinds of *magades*, the one a string instrument, formed of 20 chords arranged in pairs, and tuned to unison or octave, so that they yielded ten sounds; the invention whereof is ascribed by some to Sappho; by others, to the Lydians; and by some, to Timotheus of Miletus. The other was a kind of flute, which at the same time yielded very high and very low notes. The former kind was at least much improved by Timotheus of Miletus, who is said to have been impeached of a crime, because by increasing the number of chords he spoiled and discredited the ancient music.

MAGAZINE, a place in which stores are kept, of arms, ammunition, provisions, &c. Every fortified town ought to be furnished with a large magazine, which should contain stores of all kinds, sufficient to enable the garrison and inhabitants to hold out a long siege; and in which smiths, carpenters, wheel-wrights, &c. may be employed in making every thing belonging to the artillery; as carriages, waggon, &c.

Powder MAGAZINE, is that place where the powder is kept in very large quantities. Authors differ greatly both with regard to the situation and construction; but all agree, that they ought to be arched and bomb-proof. In fortifications, they are frequently placed in the rampart; but of late they have been built in different parts of the town. The first powder-magazines were made with Gothic arches: but M. Vauban finding them too weak, constructed them in a semicircular form; whose dimensions are 60 feet long within, 25 broad; the foundations are eight or nine feet thick, and eight feet high from the foundation to the spring of the arch; the floor is two feet from the ground, which keeps it from dampness.

One of our engineers of great experience some time since had observed, that after the centres of semicircular arches are struck, they settle at the crown and rise up at the hanches, even with a straight horizontal extrados, and still much more so in powder-magazines, whose outside at top is formed like the roof of a house, by two inclined planes joining in an angle over the top of the arch, to give a proper descent to the rain; which effects are exactly what might be expected agreeable to the true theory of arches. Now, as this shrinking of the arches must be attended with very ill consequences, by breaking the texture of the cement after it has been in some degree dried, and also by opening the joints of the voussoirs at one end, so a remedy is provided for this inconvenience with regard to bridges, by the *arch of equilibration* in Mr Hutton's book on bridges; but as the ill effect is much greater in powder-magazines, the same ingenious gentleman proposed to find an arch of equilibration for them also, and to construct it when the span is 20 feet, the pitch or height 10 (which are the same dimensions as the semicircle), the inclined exterior walls at top forming an angle of 113 degrees, and the height of their angular point above the top of the arch equal to seven feet. This very curious question was answered in 1775 by the reverend Mr Wildbore, to be found in Mr Hutton's *Miscellanea Mathematica*.

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Artillery MAGAZINE. In a siege, the magazine is made about 25 or 30 yards behind the battery, towards the parallels, and at least three feet underground, to hold the powder, loaded shells, port fires, &c. Its sides and roof must be well secured with boards to prevent the earth from falling in: a door is made to it, and a double trench or passage is sunk from the magazine to the battery, one to go in and the other to come out at, to prevent confusion. Sometimes traverses are made in the passages to prevent ricochet shot from plunging into them.

MAGAZINE, on ship-board, a close room or storehouse, built in the fore or after part of the hold, to contain the gunpowder used in battle. This apartment is strongly secured against fire, and no person is allowed to enter it with a lamp or candle: it is therefore lighted, as occasion requires, by means of the candles or lamps in the *light-room* contiguous to it.

MAGAZINE Air-Gun. See *AIR-GUN*.

MAGAZINES (Literary); a well known species of periodical publications, of which the first that appeared was *The Gentleman's*, set on foot by the inventor Mr Edward Cave in the year 1731: (see the article *CAVE*). This, as Dr Kippis observes*, "may be considered as something of an epocha in the literary history of this country. The periodical performances before that time were almost wholly confined to political transactions, and to foreign and domestic occurrences; but the monthly magazines have opened a way for every kind of inquiry and information. The intelligence and discussion contained in them are very extensive and various; and they have been the means of diffusing a general habit of reading through the nation, which in a certain degree hath enlarged the public understanding. Many young authors, who have afterwards risen to considerable eminence in the literary world, have here made their first attempts in composition. Here too are preserved a multitude of curious and useful hints, observations, and facts, which otherwise might have never appeared; or if they had appeared in a more evanescent form, would have incurred the danger of being lost. If it were not an invidious task, the history of them would be no incurious or unentertaining subject. The magazines that unite utility with entertainment, are undoubtedly preferable to those (*if there have been any such*) which have only a view to idle and frivolous amusement. It may be observed, that two of them, *The Gentleman's* and *The London*, which last was begun the year after the former, have amidst their numerous rivals preserved their reputation to the present day. They have both of them, in general, joined instruction with pleasure; and this likewise hath been the case with some others of a later origin."—The original *London Magazine*, it is believed, has been discontinued for some years past.—The next oldest publication of this kind is that intitled *The Scots Magazine*; which was commenced at Edinburgh a few years posterior to the appearance of the *Gentleman's* at London; which, like it, has survived many rivals; and which still subsists, deservedly esteemed for the chasteness of its plan and the accuracy of its information.

MAGDALEN (Mary). See *MARY*.

Religious of St MAGDALEN, a denomination given to divers communities of nuns, consisting generally of penitents.

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Magde-
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nitent courtézans; sometimes also called *Magdalanettes*. Such are those at Metz, established in 1452; those at Paris, in 1492; those at Naples, first established in 1324, and endowed by Queen Sancha, to serve as a retreat for public courtézans, who should betake themselves to repentance; and those of Rouen and Bourdeaux, which had their original among those of Paris in 1618. In each of these monasteries there are three kinds of persons and congregations; the first consist of those who are admitted to make vows, and these bear the name of *St Magdalen*; the congregation of *St Martha* is the second, and is composed of those whom it is not judged proper to admit to vows; finally, the congregation of *St Lazarus* is composed of such as are detained there by force.

The religious of *St Magdalen* at Rome were established by Pope Leo X. Clement VIII. settled a revenue on them; and farther appointed, that the effects of all public prostitutes, dying intestate, should fall to them; and that the testaments of the rest should be invalid unless they bequeathed a portion of their effects, which was to be at least a fifth part, to them.

MAGDALEN-Hospital. See LONDON, n° 115.

MAGDALENA, one of the Marquesas islands, about five leagues in circuit, and supposed to be in S. Lat. 10. 25. W. Long. 138. 50. It was only seen at nine leagues distance by those who discovered it.

MAGDALENE'S CAVE, a cave of Germany, and in Carinthia, 10 miles east of Gortz. It appears like a chasm in a rock, and at the entrance torches are lighted to conduct travellers. It is divided into several apartments, or halls, with a vast number of pillars formed by nature, which give it a beautiful appearance; they being as white as snow, and almost transparent. The bottom is of the same substance, inasmuch that a person may fancy himself to be walking among the ruins of an enchanted castle, surrounded with magnificent pillars, some entire and others broken.

MAGDEBURG, a duchy of Germany, in the circle of Lower Saxony; bounded on the north by the duchy of Mecklenburgh, on the south and south-west by the principality of Anhalt and Halberstadt, on the east by Upper Saxony with part of Brandenburg, and on the west by the duchy of Wolfenbüttele. The Saale circle, and that of Luxkenwalde, are separated from the rest, and surrounded on all sides by a part of Upper Saxony. This country is, for the most part, level; but sandy, marshy, or overgrown with woods. There are salt springs in it so rich, that they are sufficient to supply all Germany with that commodity. The Holz circle is the most fruitful part of it. In the Saale circle, where wood is scarce, there is pit-coal: and at Rothenburg is a copper-mine worked. The duchy is well watered, for the Elbe passes through it; and the Saale, Havel, Aller, Ohre, and Elster, either rise in, or wash some part of it in their course. The whole duchy, exclusive of that part of the county of Mansfeldt which is connected with it, is said to contain 29 cities, six towns, about 430 villages, and 330,000 inhabitants. The states of the country consist of the clergy, the nobility, and deputies of the cities. Before it became subject to the electoral house of Brandenburg, frequent diets

were held in it; but at present no diets are held, nor have the states the direction of the finances as formerly. Before the Reformation, it was an archbishopric, subject in spirituals to the pope alone, and its prelate was primate of all Germany; but embracing the Reformation, it chose itself administrators, till the treaty of Munster in 1648, when it was given, together with the bishopric of Halberstadt, to the elector of Brandenburg, as an equivalent for the Hither Pomerania, granted by that treaty to the king of Sweden. Lutheranism is the predominant religion here; but Calvinists, Jews, and Roman-catholics, are tolerated. Of the last there are five convents, who never embraced the Reformation. All the Lutheran parishes, amounting to 314, are subject to 16 inspectors, under one general superintendant; only the clergy of the old town of Magdeburg are under the direction of their senior. The Jews have a synagogue at Halle. The manufactures of the duchy are cloth, stuffs, stockings, linen, oil-skins, leather, and parchment; of which, and grain of all sorts, large quantities are exported. The arms of it are, Party per pale, ruby, and pearl. The king of Prussia, as duke of Magdeburg, sits and votes between the elector of Bavaria, as duke of Bavaria, and the elector palatine, as palgrave of Lautern. Of the states of the circle of Lower Saxony he is the first. His matricular assessment for the duchy is 43 horse and 196 foot, or 1300 florins monthly; and to the chamber of Witzlar 343 florins and 40 kruitzers. For the civil government of the duchy there is a council of regency, with a war and demesne chamber; and for the ecclesiastical, a consistory, and general superintendant. The revenues of the duchy, arising from the salt-works, demesnes, and taxes, some of which are very heavy and oppressive, are said to amount to 800,000 rixdollars annually. With respect to salt, every housekeeper in the Prussian dominions is obliged to buy a certain quantity for himself and wife; and also for every child and servant, horse, cow, calf, and sheep, that he possesses. The principal places are Magdeburg, Halle, and Glauche.

MAGDEBURG, a city of Germany, in a duchy of the same name, of which it is not only the capital, but that of all Lower Saxony, and formerly even of all Germany. It stands on the Elbe, in E. Long. 12. 9. N. Lat. 52. 16. It is a city of great trade, strongly fortified, and very ancient. Its name signifies the *maiden city*; which, some imagine, took its rise from the temple of Venus, which is said to have stood here anciently, and to have been destroyed by Charlemagne. The founder of the city is supposed to have been Otho I. or his empress Editha, daughter to Edmund the Saxon king of England. The same emperor founded a Benedictine convent here, which he afterwards converted into an archbishopric, of which the archbishop was a count-palatine, and had very great privileges, particularly that of wearing the archiepiscopal pallium, and having the cross borne before him, besides many others. The first tournament in Germany is said to have been appointed near this city, by the emperor Henry the Fowler; but these pastimes were afterwards abolished, because they occasioned such envy and animosity among the nobility, that several of them killed one another upon the spot.

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burg.

Magde-
burg,
Magdolum

spot. The situation of the city is very convenient and pleasant, upon the banks of the Elbe, amidst spacious fruitful plains, and on the road betwixt High and Low Germany. It has been a great sufferer by fires and sieges; but by none so much as that in 1631, when the emperor's general, count Tilly, took it by storm, plundered and set it on fire, by which it was entirely reduced to ashes, except the cathedral, the convent of our Lady, and a few cottages belonging to fishermen; of 40,000 burghers, not above 400 escaping. The soldiers spared neither age nor sex; but ripped up women with child, murdered sucking infants in sight of their parents, and ravished young women in the streets; to prevent which violation, many of them flung themselves into the Elbe, and others into the fire. The city is now populous, large, and well built, particularly the broad street and cathedral-square. The principal buildings are the king's palace, the governor's house, the armoury, guild-hall, and cathedral. The last is a superb structure in the antique taste, dedicated to St Maurice, which has a fine organ, the master-pipe of which is so big, that a man can scarce clasp it with both arms; it also contains the tombs of the emperor Otho and the empress Editha; a fine marble statue of St Maurice, a porphyry font, an altar in the choir of one stone of divers colours, curiously wrought, and many other curiosities. They show here a bedstead and table which belonged to Martin Luther, when he was an Augustine friar in a cloyster of this city before the Reformation. Among the reliëts, they pretend to have the bason in which Pilate washed his hands after his condemnation of our Saviour; the lantern which Judas made use of when he apprehended him; and the ladder on which the cock crowed after St Peter denied him. The chapter consists of a provost, 16 major and seven minor canons; besides which, there are four other Lutheran collegiate foundations, and a Lutheran convent dedicated to our Lady, in which is a school or seminary. Here is also a gymnasium, with an academy, in which young gentlemen are instructed in the art of war. The canons of the chapter, which, except the change of religion, is upon the same footing as before the Reformation, must make proof of their nobility. The prebends and dignities are all in the gift of the elector; and the revenue of the provost is computed at 12,000 crowns a-year. Here is a great trade, and a variety of manufactures. The chief are those of woollen cloths and stuffs, silks, cottons, linen, stockings, hats, gloves, tobacco and snuff. The city was formerly one of the Hanse and Imperial towns. Editha, consort to Otho I. on whom it was conferred as a dowry, among many other privileges and advantages, procured it the grant of a yearly fair. The bargravate of this city was anciently an office of great power; having the civil and criminal jurisdiction, the office of hereditary cup-bearer being annexed to it; and was long held as a fief of the archbishopric, but afterwards became an imperial fief, which was again conferred on the archbishopric by the elector of Saxony, upon certain conditions.

MAGDOLUM, or MAGDALUM (anc. geog.), a town of the Lower Egypt, twelve miles to the south of Pelusium (Herodotus, Antonine), which doubtless is the Migdol or Magdol of Jeremiah.—Another

MAGDALUM, or MIGDOL, denoting literally "a tower or place of strength," near the Red Sea, (Moses); far to the south of the former.

MAGELLAN (Ferdinand), a celebrated Portuguese mariner in the 16th century. He being dissatisfied with the king of Portugal, went into the service of the emperor Charles V. and sailed from Seville with five vessels in 1519, when he discovered and passed the strait to which he gave his own name, and sailed through the South Sea to the Ladrone Islands, when, according to some authors, he was poisoned in 1520; though others say that he was killed in a mutiny of his people in the island of Mutan, on account of his severity. His voyage round the world was written by one on board, and has been frequently printed in English. His suddenly converting to the Christian religion people whose language was unknown to him, as his was to them, is an absurdity that discredits this work.

Straits of MAGELLAN, a narrow passage between the island of Terra del Fuego and the southern extremity of the continent of America. This passage was first discovered by Ferdinand Magellan, who sailed through it into the South Sea, and from thence to the East Indies. Other navigators have passed the same way; but as these straits are exceedingly difficult, and subject to storms, it has been common to sail by Cape Horn, rather than through the Straits of Magellan. See *Straits Le MAIRE*, and *TERRA del Fuego*.

MAGELLANIC-CLOUDS, whitish appearances like clouds, seen in the heavens towards the south pole, and having the same apparent motion as the stars. They are three in number, two of them near each other. The largest lies far from the south pole; but the other two are not many degrees more remote from it than the nearest conspicuous star, that is, about 11 degrees. Mr Boyl conjectures, that if these clouds were seen through a good telescope, they would appear to be multitudes of small stars, like the milky-way.

MAGGI (Jerome), in Latin *Magius*, one of the most learned men of the 16th century, was born at Anghiari in Tuscany. He applied himself to all the sciences, and even to the art of war; and distinguished himself so much in this last study, that the Venetians sent him into the island of Cyprus in quality of judge of the admiralty. When the Turks besieged Famagusta, he performed all the services that could be expected from the most excellent engineer: he invented mines and machines for throwing fire, by means of which he destroyed all the works of the besiegers, and in an instant overthrew what had cost the Turks infinite labour. But they had their revenge; for, taking the city in 1571, they plundered his library, carried him loaded with chains to Constantinople, and treated him in the most inhuman and barbarous manner. He nevertheless comforted himself from the example of Æsop, Menippus, Epictetus, and other learned men; and, after passing the whole day in the meanest drudgery, he spent the night in writing. He composed, by the help of his memory alone, treatises filled with quotations, which he dedicated to the Imperial and French ambassadors. These ministers, moved by compassion for this learned man, resolved to purchase

Magellan
||
Maggi.

Maggot.

him: but while they were treating for his ransom, Maggi found means to make his escape, and to get to the Imperial ambassador's house; when the Grand Vizir being enraged at his flight, and remembering the great mischief he had done the Turks during the siege of Famagusta, sent to have him seized, and caused him to be strangled in prison in 1572. His principal works are, 1. A treatise on the bells of the ancients. 2. On the destruction of the world by fire. 3. Commentaries on Æmilius Probus's lives of illustrious men. 4. Commentaries on the institutes. These works are written in elegant Latin. He also wrote a treatise on fortification in Italian; and a book on the situation of ancient Tuscany.

He ought not to be confounded with his brother *Bartholomew Maggi*, a physician at Bologna, who wrote a treatise of gun-shot wounds; nor with *Vincent Maggi*, a native of Bresse, and a celebrated professor of humanity at Ferrare in Padua, who was the author of several works.

MAGGOT, the common name of the fly-worm bred in flesh, from the egg of the great blue flesh-fly. Notwithstanding the distaste for this animal, its figure and structure of parts are greatly worth attending to; and may serve as a general history of the class of worms produced from the eggs of flies.

This animal is white and fleshy; its body is composed of a number of rings, like the bodies of caterpillars and other similar insects; and is capable, at the pleasure of the animal, of assuming different figures; being at times more or less extended in length, and consequently more or less thick.

Notwithstanding that this animal has no legs, it is able to move itself very swiftly; and in its first attempt to move its body, is extended to its greatest length, and assumes something of the figure of a pointed cone. The pointed part of the cone is the head of the animal, and is not separated from the next ring by any deeper furrow than the rest of the rings are from one another. In some states of the animal, one may see two short horns thrust out from the head; but more generally two scaly hooks are observable: these are, however, sometimes hid, and have each of them a case or sheath; into which the animal can retract them at pleasure. These hooks are bent into an arch, the concavity of which is towards the plane on which the creature is placed; and they are thickest at their insertion in the head, and thence diminish gradually, till they terminate in a fine sharp point.

These two hooks are placed in a parallel direction, and can never come together, and therefore cannot serve in the place of teeth for grinding the food; but merely to pull and sever it in pieces, that it may be of a proper size for the mouth of the creature. Besides these hooks the maggot has a kind of dart, which is about a third part of their length, and is placed at an equal distance between them. This also is brown and scaly like them; it is quite straight, and terminates in a fine point. The hooks have as it were two scaly thorns at their points; and this dart seems intended, by reiterated strokes, to divide and break the pieces of flesh these have separated from the rest into smaller parts. Immediately below the apertures for the egress of the hooks, is placed the mouth of the animal; the creature does not show this little opening unless pres-

sed: but if the pressure is properly managed, it will sufficiently open it, and there may be discovered within it a small protuberance, which may very naturally be supposed either the tongue or the sucker of the animal. The hooks in these creatures not only supply the place of teeth, but also of legs; since it is by fastening these hooks into the substance it is placed on, and then drawing up its body to it, that it pulls itself along.

The back of this creature lowers itself by degrees as it approaches the extremity of the belly; and near the place where the back begins to lower itself, are placed the creature's two principal organs of respiration. One may perceive there two small roundish brown spots: they are very easily distinguishable by the naked eye, because the rest of the body of the creature is white; but if we take in the assistance of glasses, each of these spots appears to be a brown circular eminence raised a little above the rest of the body. On each of these spots one may also discover three oblong oval cavities, something of the shape of button-holes; these are situated in a parallel direction to one another, and their length nearly in a perpendicular direction to that of the body of the animal. These apertures are so many stigmata or air-holes; openings destined to admit the air necessary to the life of the animal. It has six of these stigmata, three in each side of its body.

The great transparency of the body of this animal gives us an opportunity also to distinguish that it has on each side a large white vessel running the whole length of the body. It is easy to follow the course of these vessels through their whole length, but they are most distinct of all towards its hinder part; and they are always seen to terminate each in the brown spot above mentioned: this leaves us no room to doubt that they are the two principal tracheæ.

The ramifications of the two great tracheæ are very beautifully seen in this creature, especially on its belly: and it is remarkable, that no vessel analogous to the great artery in the caterpillar class can be discovered in these; though, if there were any such, their great transparency must needs make them very easily distinguishable; nor could its dilatations and contractions, if so considerable as in that class of animals, be less so. See ERUCA.

Malpighi imagined, that this artery in the caterpillar class was a series of hearts; in its place, however, there may be seen in these animals a true heart. It is easy to observe in these creatures, about the fourth ring of their body, a small fleshy part, which has alternate contractions and dilatations; and is not only discoverable in the body by means of its transparency, but on making a proper section of them in the second, third, and fourth, will be thrown out of the body of the creature, and continue its beats for some time afterwards.

MAGI, or **MAGIANS**, an ancient religious sect in Persia, and other eastern countries, who maintained that there were two principles, one the cause of all good, the other the cause of all evil: and, abominating the adoration of images, they worshipped God only by fire; which they looked upon as the brightest and most glorious symbol of Oromasdes, or the good God; as darkness is the truest symbol of Arimanius, or the evil god. This religion was reformed by Zoroaster, who main-

Maggot.
Magi.

Magic.

maintained that there was one supreme independent Being; and under him two principles or angels, one the angel of goodness and light, and the other of evil and darkness: that there is a perpetual struggle between them, which shall last to the end of the world; that then the angel of darkness and his disciples shall go into a world of their own, where they shall be punished in everlasting darkness; and the angel of light and his disciples shall also go into a world of their own, where they shall be rewarded in everlasting light.

The priests of the magi were the most skilful mathematicians and philosophers of the ages in which they lived, inasmuch that a learned man and a magian became equivalent terms. The vulgar looked on their knowledge as supernatural; and hence those who practised wicked and mischievous arts, taking upon themselves the name of *magians*, drew on it that ill signification which the word magician now bears among us.

This sect still subsists in Persia under the denomination of *gaur*s, where they watch the sacred fire with the greatest care, and never suffer it to be extinguished.

MAGIC, MAGIA, MAGEIA, in its ancient sense, the science or discipline and doctrine of the magi, or wise men of Persia. See MAGI.

The origin of magic and the magi is ascribed to Zoroaster. Salmassius derives the very name from Zoroaster, who, he says, was surnamed *Mog*, whence *Magus*. Others, instead of making him the author of the Persian philosophy, make him only the restorer and improver thereof; alleging, that many of the Persian rites in use among the magi were borrowed from the Zabii among the Chaldeans, who agreed in many things with the magi of the Persians; whence some make the name *magus* common both to the Chaldeans and Persians. Thus Plutarch mentions, that Zoroaster instituted magi among the Chaldeans, in imitation whereof the Persians had theirs too.

MAGIC, in a more modern sense, is a science which teaches to perform wonderful and surprising effects.

The word *magic* originally carried with it a very innocent, nay, laudable meaning; being used purely to signify the study of wisdom, and the more sublime parts of knowledge; but in regard the ancient magi engaged themselves in astrology, divination, sorcery, &c. the term *magic* in time became odious, and was only used to signify an unlawful and diabolical kind of science, depending on the assistance of the devil and departed souls.

If any wonder how so vain and deceitful a science should gain so much credit and authority over mens minds, Pliny gives the reason of it. It is, says he, because it has possessed itself of three sciences of the most esteem among men; taking from each all that is great and marvellous in it. Nobody doubts but it had its first origin in medicine; and that it insinuated itself into the minds of the people, under pretence of affording extraordinary remedies. To these fine promises it added every thing in religion that is pompous and splendid, and that appears calculated to blind and captivate mankind. Lastly, it mingled judicial astrology with the rest; persuading people, curious of futurity, that it saw every thing to come in the heavens.

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Agrippa divides magic into three kinds; natural, celestial, and ceremonial or superstitious.

Natural MAGIC is no more than the application of natural active causes to passive subjects; by means whereof many surprising, but yet natural, effects are produced.

In this way many of our experiments in natural philosophy, especially those of electricity, optics, and magnetism, have a kind of magical appearance, and among the ignorant and credulous might easily pass for miracles. Such, without doubt, have been some of those miracles wrought by ancient magicians, whose knowledge of the various powers of nature, there is reason to believe, was much greater than modern vanity will sometimes allow †.

Baptista Porta has a treatise of natural magic, or of secrets for performing very extraordinary things by natural causes. The natural magic of the Chaldeans was nothing but the knowledge of the powers of simples and minerals. The magic which they called *theurgia*, consisted wholly in the knowledge of the ceremonies to be observed in the worship of the gods, in order to be acceptable. By virtue of these ceremonies they believed they could converse with spiritual beings, and cure diseases.

Celestial MAGIC, borders nearly on judiciary astrology: it attributes to spirits a kind of rule or dominion over the planets, and to planets a dominion over men; and on those principles builds a ridiculous kind of system. See ASTROLOGY.

Superstitious or *Goetic MAGIC*, consists in the invocation of devils. Its effects are usually evil and wicked, though very strange, and seemingly surpassing the powers of nature; supposed to be produced by virtue of some compact, either tacit or express, with evil spirits: but the truth is, these have not all the power that is usually imagined, nor do they produce those effects ordinarily ascribed to them.

This species of magic, there is every reason to believe, had its origin in Egypt, the native country of paganism. The first magicians mentioned in history were Egyptians; and that people so famed for early wisdom believed not only in the existence of dæmons, the great agents in magic (see DÆMON), but also that different orders of those spirits presided over the elements of earth, air, fire, and water, as well as over the persons and affairs of men. Hence they ascribed every disease with which they were afflicted to the immediate agency of some evil dæmon. When any person was seized with a fever, for instance, they did not think it necessary to search for any natural cause of the disease; it was immediately attributed to some dæmon which had taken possession of the body of the patient, and which could not be ejected but by charms and incantations.

These superstitious notions, which had spread from Egypt over all the east, the Jews imbibed during their captivity in Babylon. Hence we find them in the writings of the New Testament attributing almost every disease to which they were incident to the immediate agency of devils (see POSSESSION). Many of the same impious superstitions were brought from Egypt and Chaldea by Pythagoras, and transmitted by him and his followers to the Platonists in Greece. This

† See *Stil-*
lingfleet's
Origines Sa-
cræ, book ii.
c. 2.

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is apparent from the writers of the life of Pythagoras. Jamblicus, speaking of the followers of that philosopher, says expressly, that they cured certain diseases by incantations; and Porphyry adds, that they cured diseases both of the mind and of the body by songs and incantations. This was exactly the practice of the Egyptian priests, who were all supposed to keep up a constant intercourse with dæmons, and to have the power of controuling them by magical charms and sacred songs. Agreeably to this practice of his masters, we are told that Pythagoras directed certain diseases of the mind, doubtless those which he attributed to the agency of dæmons, to be cured partly by *incantations*, partly by *magical hymns*, and partly by *music*.—

και τας ψυχας δε νοσούντας παρεμβύειο τους μεν επωδαις και μαγικαις τους δε μουσικη.

† See his edition of Cudworth's Intellectual System.

That there are different orders of created spirits,—whether called dæmons or angels,—whose powers intellectual and active greatly surpass the powers of man, reason makes probable, and revelation certain. Now it was the universal belief of the ancient nations, says the learned Mosheim †, and especially of the orientals, that certain sounds and words, for the most part barbarous, were highly grateful, and that others were equally disagreeable, to these spirits. Hence, when they wished to render a dæmon propitious, and to employ him on any particular office, the magicians composed their sacred songs of the words which were believed to be agreeable to him; and when it was their intention to drive him from themselves or others, they sung in a strain which they fancied a dæmon could not hear but with horror. From the same persuasion arose the custom of suspending from the neck of a sick person, whose disease was supposed to be inflicted by a dæmon, an amulet, sometimes made of gold and sometimes of parchment, on which was written one or more of those words which dæmons could not bear either to hear or to see: and in a didactic poem on the healing art still extant, we are taught by *Serenus Sammonicus*, that the word *ABRACADABRA* is an infallible remedy for a semitertian fever or ague; and to banish grief of heart, *Marcellinus* thinks nothing more effectual than the word *κοριαγκαν*. In more modern times, as we are informed by Agrippa, the words used by those in compact with the devil, to invoke him, and to succeed in what they undertake, are, *Dies, mies, jesquet, benedoeset, douvima, enitemaus*. There are an hundred other formulas of words composed at pleasure, or gathered from several different languages, or patched from the Hebrew, or formed in imitation of it. And among the primitive Christians there was a superstitious custom, of which we suspect some remains may yet be found among the illiterate vulgar in different countries, of fastening to the neck of a sick person, or to the bed on which he lay, some text from the New Testament, and especially the first two or three verses of the gospel of St John, as a charm undoubtedly efficacious to banish the disease.

That magicians who could thus cure the sick, were likewise believed to have the power of inflicting diseases, and of working miracles, by means of their subservient dæmons, need not be doubted. Ancient writers of good credit are full of the wonders which they performed. We shall mention a few of those which are best attested, and inquire whether they might not

have been effected by other means than the interposition of dæmons.

The first magicians of whom we read are those who in Egypt opposed Moses. And we are told, that, when Aaron cast down his rod, and it became a serpent, they also did the like with their incantments; “for they cast down every man his rod, and they became serpents.” This was a phenomenon which, it must be confessed, had a very miraculous appearance; and yet there seems to have been nothing in it which might not have been effected by slight of hand. The Egyptians, and perhaps the inhabitants of every country where serpents abound, have the art of depriving them of their power to do mischief, so that they may be handled without danger. It was easy for the magicians, who were favoured by the court, to pretend that they changed their rods into serpents, by dexterously substituting one of those animals in place of the rod. In like manner they might pretend to change water into blood, and to produce frogs; for if Moses gave in these instances, as we know he did in others, any previous information of the nature of the miracles which were to be wrought, the magicians might easily provide themselves in a quantity of blood and number of frogs sufficient to answer their purpose of deceiving the people. Beyond this, however, their power could not go. It stopped where that of all workers in legerdemain must have stopt—at the failure of proper materials to work with. Egypt abounds with serpents; blood could be easily procured; and without difficulty they might have frogs from the river: But when Moses produced lice from the dust of the ground, the magicians, who had it not in their power to collect a sufficient quantity of these animals, were compelled to own this to be an effect of divine agency.

The appearance of Samuel to Saul at Endor is the next miracle, seemingly performed by the power of magic, which we shall consider. It was a common pretence of magicians, that they could raise up ghosts from below, or make dead persons appear unto them to declare future events; and the manner of their incantation is thus described by Horace:

— Pallor utraque

Fecerat horrendas aspectu. Scalpere terram
Unguibus, et pullam divellere mordicus agnam
Cœperunt: cruor in fossam confusus, ut inde
Manes elicerent, animas responsa daturas.

“With yellings dire they fill’d the place,
And hideous pale was either’s face.
Soon with their nails they scrap’d the ground,
And fill’d a magic trench profound
With a black lamb’s thick-streaming gore,
Whose members with their teeth they tore;
That they might charm the sprites to tell
Some curious anecdotes from hell.”

FRANCIS.

Whether the witch of Endor made use of such infernal charms as these, the sacred historian has not informed us; but Saul addressed her, as if he believed that by some form of incantation she could recal from the state of departed spirits the soul of the prophet who had been for some time dead. In the subsequent apparition, however, which was produced,
some

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some have thought there was nothing more than a trick, by which a cunning woman imposed upon Saul's credulity, making him believe that some confident of her own was the ghost of Samuel. But had that been the case, she would undoubtedly have made the pretended Samuel's answer as pleasing to the king as possible, both to save her own life, which appears from the context to have been in danger, and likewise to have procured the larger reward. She would never have told her sovereign, she durst not have told him, that he himself should be shortly slain, and his sons with him; and that the host of Israel should be delivered into the hands of the Philistines. For this reason many critics, both Jewish and Christian, have supposed that the apparition was really a dæmon or evil angel, by whose assistance the woman was accustomed to work wonders, and to foretel future events. But it is surely very incredible, that one of the apostate spirits of hell should have upbraided Saul for applying to a *forerefs*, or should have accosted him in such words as these: "Why hast thou disquieted *me*, to bring *me* up? Wherefore dost thou ask of *me*, seeing the *Lord* is departed from thee, and is become thine enemy? For the *Lord* hath rent the kingdom out of thine hand, and given it to thy neighbour, even to David. Because thou obeydest not the voice of the *Lord*, therefore the *Lord* hath done this thing to thee this day." It is to be observed farther, that what was here denounced against Saul was really prophetic, and that the event answered to the prophecy in every particular. Now, though we do not deny that there are created spirits of penetration vastly superior to that of the most enlarged human understanding; yet we dare maintain, that no finite intelligence could by its own mere capacity have ever found out the precise time of the two armies engaging, the success of the Philistines, the consequences of the victory, and the very names of the persons that were to fall in battle. Saul and his sons were indeed men of tried bravery, and therefore likely to expose themselves to the greatest danger; but after the menaces which he received from the apparition, he would have been impelled, one should think, by common prudence, either to chicanery with the enemy, or to retire from the field without exposing himself, his sons, and the whole army, to certain and inevitable destruction; and his acting differently, with the consequences of his conduct, were events which no limited understanding could either foresee or certainly foretel. If to these circumstances we add the suddenness of Samuel's appearance, with the effect which it had upon the *forerefs* herself, we shall find reason to believe, that the apparition was that of no evil dæmon. There is not, we believe, upon record, another instance of any person's pretending to raise a ghost from below, without previously using some magical rites or some form of incantation. As nothing of that kind is mentioned in the case before us, it is probable that Samuel appeared before he was called. It is likewise evident from

3

the narrative, that the apparition was not what the woman expected; for we are told, that "when she saw Samuel, she cried out for fear." And when the king exhorted her not to be afraid, and asked what she saw, "the woman said, I see gods (*elohim*) ascending out of the earth." Now, had she been accustomed to do such feats, and known that what she saw was only her subservient dæmon, it is not conceivable that she could have been so frightened, or have mistaken her familiar for *elohim* in any sense in which that word can be taken. We are therefore strongly inclined to adopt the opinion of those who hold that it was Samuel himself who appeared and prophesied, not called up by the wretched woman or her demons, but, to her utter confusion, and the disgrace of her art, sent by God to rebuke Saul's madness in a most affecting and mortifying way, and to deter all others from ever applying to magicians or dæmons for assistance when refused comfort from heaven. For though this hypothesis may to a superficial thinker seem to transgress the rule of Horace—*Nec deus interfit*, &c.—which is as applicable to the interpretation of scripture, as to the introduction of supernatural agency in human compositions; yet he who has studied the theocratical constitution of Israel, the nature of the office which was there termed regal, and by what means the administration was in emergencies conducted, will have a different opinion, and at once perceive the *dignus vindice nodus*.

The sudden and wonderful destruction of the army of Brennus the Gaul, has likewise been attributed to magic, or, what in this inquiry amounts to the same thing, to the interposition of evil spirits, whom the priests of Apollo invoked as gods. Those barbarians had made an inroad into Greece, and invested the temple of Apollo at Delphi, with a view to plunder it of the sacred treasure. Their numbers and courage overpowered all opposition; and they were just upon the point of making themselves masters of the place, when, Justin informs us, that, to encourage the besieged, the priests and prophets "advenisse deum clamant; eumque se vidisse desilientem in templum per culminis aperta fastigia. Dum omnes opem dei suppliciter implorant, juvenem supra humanum modum insignis pulchritudinis, comitesque ei duas armatas virgines, ex propinquis duabus Dianæ Minervæque ædibus occurrisse, nec oculis tantum hæc se perpexisse; audisse etiam stridorem arcus, ac strepitum armorum: proinde ne cunctarentur, diis antesignanis, hostem cedere, et victoriæ deorum socios se adjungere," summis obsecrationibus monebant. Quibus vocibus incensi, omnes certatim in prælium profiliunt. Præsentiam Dei et ipsi statim sentire: nam et terræ motu portio montis abrupta Gallorum stravit exercitum, et confertissimi cunei non sine vulneribus hostium dissipati ruebant. Infecuta deinde tempestas est, quæ grandine et frigore faucios ex vulneribus absumpsit (A)."

This was unquestionably an extraordinary event; and

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"(A) Called aloud that the god had arrived. That they had seen him leap into the temple through the aperture in the roof: That whilst they were all humbly imploring his help, a youth of more than human beauty, accompanied by two virgins in armour, had run to their assistance from the neighbouring temples of Diana and

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and it must be ascribed either to the immediate interposition of the Supreme Being, to natural means, or to the agency of dæmons: there is no other alternative. But it is altogether incredible that the Supreme Being should have miraculously interposed to defend the temple of a pagan divinity. It is very difficult to suppose that an earthquake, produced in the ordinary course of nature, should have been foretold by the priests, or that it could have happened so opportunely for the preservation of their treasure from the hands of fierce barbarians. Nothing, therefore, it has been said, remains, but either to allow the earthquake to have been produced by evil spirits, or to deny the truth of the historian's relation. But the catastrophe of Brennus's army is recorded in the same manner by so many ancient writers of good credit, that we cannot call in question their veracity: and therefore, being unwilling to admit the agency of dæmons into this affair, it will be incumbent on us to show by what human contrivance it might have been effected; for its arrival at so critical a juncture will not easily suffer us to suppose it a mere *natural* event.

Julian.

"The inclination of a Pagan priest (says Bishop Warburton†) to assist his god in extremity, will hardly be questioned; and the inclination of those at Delphi was not ill seconded by their public management and address. On the first rumour of Brennus's march against them, they issued orders, as from the oracle, to all the region round, forbidding the country people to secrete or bear away their wine and provisions. The effects of this order succeeded to their expectations. The half-starved barbarians finding, on their arrival in Phocis, so great a plenty of all things, made short marches, dispersed themselves over the country, and revelled in the abundance that was provided for them. This respite gave time to the friends and allies of the god to come to his assistance. Their advantages of situation likewise supported the measures which they had taken for a vigorous defence. The town and temple of Delphi were seated on a bare and cavernous rock, defended on all sides with precipices instead of walls. A large recess within assumed the form of a theatre; so that the shouts of soldiers, and the sounds of military instruments, re-echoing from rock to rock, and from cavern to cavern, increased the clamour to an immense degree; which, as the historian observes, could not but have great effects on ig-

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norant and barbarous minds. The playing off these panic terrors was not indeed of itself sufficient to repulse and dissipate a host of fierce and hungry invaders, but it enabled the defenders to keep them at bay till a more solid entertainment was provided for them, in the *explosion* and fall of that portion of the rock at the foot of which the greater part of the army lay encamped.

"Among the caverns in the sacred rock, there was one which, from an intoxicating quality discovered in the steam which issued from it, was rendered very famous by being fitted to the recipient of the priestess of Apollo (A). Now, if we only suppose this, or any other of the vapours emitted from the numerous fissures, to be endowed with that unctuous, or otherwise inflammatory quality, which modern experience shows to be common in mines and subterraneous places, we can easily conceive how the priests of the temple might, without the agency of dæmons, be able to work the wonders which history speaks of as effected in this transaction. For the throwing down a lighted torch or two into a chasm whence such a vapour issued, would set the whole into a flame; which, by suddenly rarifying and dilating the air, would, like fired gun-powder, blow up all before it. That the priests, the guardians of the rock, could be long ignorant of such a quality, or that they would divulge it when discovered, cannot be supposed. Strabo relates, that one *Onomarchus*, with his companions, as they were attempting by night to dig their way through to rob the holy treasury, were frightened from their work by the violent shaking of the rock; and he adds, that the same phenomenon had defeated many other attempts of the like nature. Now, whether the tapers which *Onomarchus* and his companions were obliged to use while they were at work, inflamed the vapour, or whether the priests of Apollo heard them at it, and set fire to a counter mine, it is certain a quality of this kind would always stand them in stead. Such then (presumes the learned prelate) was the expedient (B) they employed to dislodge this nest of hornets, which had settled at the foot of their sacred rock; for the storm of thunder, lightning, and hail, which followed, was the natural effect of the violent concussions given to the air by the explosion of the mine."

Two instances more of the power of ancient magic we shall just mention, not because there is any thing

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and Minerva; and that they had not only beheld these things with their eyes, but had also heard the whizzing of his bow and the clangor of his arms. They therefore earnestly exhorted the besieged not to neglect the heavenly signal, but to fall out upon their enemies, and partake with the divinities of the glory of the victory." With these words the soldiers being animated, eagerly rushed to battle: and were themselves quickly sensible of the presence of the god; for part of the rock being torn away by an earthquake, rolled down upon the Gauls; whose thickest battalions being thus thrown into confusion, fled, exposed to the weapons of their enemies. Soon afterwards a tempest arose, which by cold and the fall of hailstones cut off the wounded.

(A) "In hoc rupis anfractu, media ferme montis altitudine, planities exigua est, atque in ea profundum terræ foramen, quod in oraculo patet, ex quo frigidus spiritus, vi quadam velut vento in sublime expulsum, mentes vatum in recordiam vertit, impletasque deo responsa consulentibus dare cogit." JUST. lib. 24. c. 10.

(B) The learned author, by arguments too tedious to be here enumerated, confirms the reasoning which we have borrowed from him; and likewise shows from history, that the priests, before they came to extremities with the sacred rock, had entered into treaty with those barbarians, and paid them a large tribute to decamp and quit the country. This adds greatly to the probability of his account of the explosion; for nothing but the absolute impossibility of getting quit of their besiegers by any other means, could have induced the priests to hazard an experiment so big with danger to themselves as well as to their enemies.

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thing particular or important in the facts, but because some credit seems to have been given to the narration by the discerning Cudworth. Philostratus, in his life of Apollonius Tyanæus, informs us, that a *laughing Dæmoniac* at Athens was cured by that magician, who ejected the evil spirit by threats and menaces; and the biographer adds, that the dæmon, at his departure, is said to have overturned a statue which stood before the porch where the cure was performed. The other instance is of the same magician freeing the city of Ephesus from the *plague* by stoning to death an old ragged beggar whom Apollonius called the *plague*, and who appeared to be a *dæmon* by his changing himself into the form of a *shagged dog*.

That such tales as these should have been thought worthy of the slightest notice by the incomparable author of the Intellectual System, is indeed a wonderful phenomenon in the history of human nature. The whole story of Apollonius Tyanæus, as is now well known, is nothing better than a collection of the most extravagant fables †: but were the narrative such as that credit could be given to the facts here related, there appears no necessity in either case for calling in the agency of evil spirits by the power of magic.—The Athenians of that age were a superstitious people. Apollonius was a shrewd impostor, long practised in the art of deceiving the multitude. For such a man it was easy to persuade a friend and confidant to act the part of the *laughing dæmoniac*; and without much difficulty the statue might be so undermined as inevitably to tumble upon a violent concussion being given to the ground at the time of the departure of the pretended dæmon. If so, this feat of magic dwindles down into a very trifling trick performed by means both simple and natural. The other case of the poor man at Ephesus, who was stoned to death, is exactly similar to that of those innocent women in our own country, whom the vulgar in the last century were instigated to burn for the supposed crime of witchcraft. We have no reason to suppose that an Ephesian mob was less inflammable or credulous than a British mob, or that Apollonius played his part with less skill than a Christian dæmonologist: and as the spirits of our witches, who were sacrificed to folly and fanaticism, were often supposed to migrate from their dead bodies into the bodies of *hares* or *cats* accidentally passing by, so might this impostor at Ephesus persuade his cruel and credulous instruments, that the spirit of their victim had taken possession of the body of the *shagged dog*.

Still it may be said, that in *magic* and *divination* events have been produced out of the ordinary course of nature; and as we cannot suppose the Supreme Being to have countenanced such abominable practices by the interposition of his power, we must necessarily attribute those effects to the agency of dæmons, or evil spirits. Thus, when Æneas consulted the Sybil, the agency of the inspiring god changed her whole appearance:

“Poscere fata
Tempus,” ait: “Deus, ecce, Deus.” Cui talia fanti
Ante fores, subito non vultus, non color unus,
Non comptæ mansere comæ: sed pectus anhelum,
Et rabie fera corda tument; majorque videri;

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Nec mortale sonans: afflata est numine quando
Jam propiore Dei.

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“Aloud she cries,
“This is the time, inquire your destinies.
He comes, behold, a god!” Thus while she said,
And shivering at the sacred entry staid,
Her colour chang’d, her face was not the same,
And hollow groans from her deep spirit came:
Her hair stood up; convulsive rage possess’d
Her trembling limbs, and heav’d her lab’ring breast;
Greater than human kind she seem’d to look,
And with an accent more than mortal spoke.
Her staring eyes with sparkling fury roll,
When all the God came rushing on her soul.”

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In answer to this, it is to be observed, that the temple of Apollo at Cumæ was an immense excavation in a solid rock. The rock was probably of the same kind with that on which the temple of Delphi was built, full of fissures, out of which exhaled perpetually a poisonous kind of vapour. Over one of these fissures was the tripod placed, from which the priestess gave the oracle. Now we learn from St Chrysostom, that the priestess was a woman: “Quæ in tripodes sedens expansa malignum spiritum per interna immisum, et per genitales partes subeuntem excipiens, furore repletur, ipsaque resolutis crinibus baccharetur, ex ore spumam emittens, et sic furoris verba loquebatur.” By comparing this account with that quoted above from Justin, which is confirmed both by Pausanias and by Strabo, it is evident, that what Chrysostom calls *malignum spiritum* was a particular kind of vapour blown forcibly through the fissure of the rock. But if there be a vapour of such a quality as, if received *per partes genitales*, would make a woman furious, there is surely no necessity for calling into this scene at Cumæ the agency of a dæmon or evil spirit. Besides, it is to be remembered, that in all mystical and magical rites, such as this was, both the priests and the persons consulting them prepared themselves by particular kinds of food, and sometimes, as there is reason to believe, by human sacrifices †, for the approach of the god or dæmon whose aid they invoked. On the present occasion, we know from the poet himself, that a cake was used which was composed of poppy-seed and honey; and Plutarch speaks of a shrub called *leucophyllus*, used in the celebration of the mysteries of Hecate, which drives men into a kind of frenzy, and makes them confess all the wickedness which they had done or intended. This being the case, the illusions of fancy occasioned by poppy will sufficiently account for the change of the sybil’s appearance, even though the inhaled vapour should not have possessed that efficacy which Chrysostom and Justin attribute to it. Even some sorts of our ordinary food occasion strange dreams, for which onions in particular are remarkable. Excessive drunkenness, as is well known, produces a disorder named by the bacchanalians of this country *the blue devils*, which consists of an immense succession of spectres, accompanied with extreme horror to the person who sees them. From these facts, which cannot be denied, there must arise a suspicion, that by using very unnatural food, such as human blood, the vilest of insects, serpents,

† Vide Lucani Pharsalia, lib. 6. et Arnob. Gentes, lib. 1.

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serpents, and medicated cakes, by shutting themselves up in solitudes and caves, and by devising every method to excite horrid and dreadful ideas or images in the fancy, the ancient magicians might by natural means produce every phenomenon which they attributed to their gods or dæmons. Add to this, that in ancient times magic was studied as a science. Now, as we cannot suppose that every one who studied it intended absolutely nothing, or that all who believed in it were *wholly* deceived; what can we infer, but that the science consisted in the knowledge of those drugs which produced the phantoms in the imagination, and of the method of preparing and properly employing them for that purpose? The celebrated Friar Bacon indeed, as far back as the 13th century, wrote a book *de Nullitate Magiæ*: but though we should allow that this book proved to demonstration, that in his time no such thing as magic existed, it never could prove that the case had always been so. At that time almost all the sciences were lost; and why not magic as well as others? It is likewise an undoubted fact, that magic at all times prevailed among the Asiatics and Africans more than among the Europeans. The reason doubtless was, that the former had the requisites for the art in much greater perfection than we. Human sacrifices were frequent among them; they had the most poisonous serpents, and the greatest variety of vegetable poisons, together with that powerful narcotic opium; all which were of essential use in mystical and magic rites. They had, besides, a burning sun, frightful deserts and solitudes; which, together with extreme fasting, were all called into their assistance, and were sufficient to produce, by natural means, the most wonderful phenomena which have ever been attributed to magical incantations. Even in our own days, we have the testimony of two travellers, whom we cannot suspect to be either liars or enthusiasts, that both the Indians and Africans perform feats for which neither they nor the most enlightened Europeans can account. The one is Mr Grose, who visited the East Indies about the year 1762; and the other is Mr Bruce, who informs us, that the inhabitants of the western coast of Africa pretend to hold a communication with the devil, and verify their assertions in such a manner that neither he nor other travellers know what to make of it: but it does not from this follow, that Mr Bruce believed that communication to be real. We have all seen one of the most illiterate men that ever assumed the title of *Doctor*, perform feats very surprising, and such as even a philosopher would have been puzzled to account for, if he had not been previously let into the secret; and yet no man supposes that *Katterfelto* holds any communication with the devil, although he has sometimes pretended it among people whose minds he supposed unenlightened.

Still it may be objected, that we have a vast number of histories of witches, who in the last century confessed, that they were present with the devil at certain meetings; that they were carried through the air, and saw many strange feats performed, too numerous and too ridiculous to be here mentioned. The best

answer to this objection seems to be that given by Dr Ferrier in his essay on Popular Illusions*. "The solemn meeting of witches (says he) are supposed to be put beyond all doubt by the numerous confessions of criminals, who have described their ceremonies, named the times and places of their meetings with the persons present, and who have agreed in their relations, though separately delivered. But I would observe, first, that the circumstances told of those festivals are in themselves ridiculous and incredible; for they are represented as gloomy and horrible, and yet with a mixture of childish and extravagant fancies, more likely to disgust and alienate than conciliate the minds of their guests. They have every appearance of uneasy dreams. Sometimes the devil and his subjects *say mass*; sometimes he *preaches* to them; more commonly he was seen in the form of a *black goat*, surrounded by imps in a thousand frightful shapes; but none of these forms are *new*, they all resemble known quadrupeds or reptiles. Secondly, I observe, that there is direct proof furnished even by demonologists, that all those supposed journeys and entertainments were nothing more than dreams. Persons accused of witchcraft have been repeatedly watched about the time they had fixed for their meeting: they have been seen to anoint themselves with soporific compositions; after which they fell into profound sleep; and on awaking several hours afterwards, they have related their journey through the air, with their amusement at the festival, and have named the persons whom they saw there." This is exactly conformable to the practice of the ancient magicians and diviners, and seems to be the true way of accounting, as well for many of the phenomena of magic, as for that extravagant and shameful superstition which prevailed so much during part of the last century, and by which such numbers of innocent men and women were cruelly put to death (c). We may indeed be assured, that the devil has it not in his power to reverse in a single instance the laws of nature without a divine permission; and we can conceive but one occasion (see POSSESSION), on which such permission could be given consistently with the wisdom and the goodness of God. All the tales, therefore, of diabolical agency in magic and witchcraft must undoubtedly be false; for a power which the devil is not himself at liberty to exert, he cannot communicate to a human creature. Were the case otherwise; were those powers, "which (according to Johnson) only the controul of Omnipotence restrains from laying creation waste, subservient to the invocations of wicked mortals; were those spirits,—

— of which the least could wield

The elements, and arm him with the force

Of all their regions," — permitted to work miracles, and either to inflict or to remove diseases at the desire of their capricious votaries, how comfortless and wretched would be the life of men! But the matter has been long ago determined by the failure of Pharaoh's magicians; who, though by legerdemain they imitated some of the miracles of Moses, could not form the vilest insect, or stand before the disease which he inflicted upon them as well as upon others.

The

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(c) For some farther account of popular illusions, see *Animal MAGNETISM*.

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Square.

The revival of learning, and the success with which the laws of nature have been investigated, have long ago banished this species of magic from all the enlightened nations of Europe. Among ourselves, none but persons grossly illiterate pay the least regard to magical charms; nor are they any where abroad more prevalent than among the inhabitants of Lapland and Iceland. These people, indeed, place an absolute confidence in the effects of certain idle words and actions; and ignorant sailors from other parts of the world are deceived by their assertions and their ceremonies. The famous *magical drum* of the Laplanders is still in constant use in that nation; and Scheffer, in his History of Lapland, has given an account of its structure.

This instrument is made of beech, pine, or fir, split in the middle, and hollowed on the flat side where the drum is to be made. The hollow is of an oval figure; and is covered with a skin clean dressed, and painted with figures of various kinds, such as stars, suns and moons, animals and plants, and even countries, lakes and rivers; and of later days, since the preaching of Christianity among them, the acts and sufferings of our Saviour and his apostles are often added among the rest. All these figures are separated by lines into three regions or clusters.

There is, besides these parts of the drum, an index and a hammer. The index is a bundle of brads or iron rings, the biggest of which has a hole in its middle, and the smaller ones are hung to it. The hammer or drumstick is made of the horn of a rein-deer; and with this they beat the drum so as to make these rings move, they being laid on the top for that purpose. In the motion of these rings about the pictures figured on the drum, they fancy to themselves some prediction in regard to the things they inquire about.

What they principally inquire into by this instrument, are three things. 1. What sacrifices will prove most acceptable to their gods. 2. What success they shall have in their several occupations, as hunting, fishing, curing of diseases, and the like; and, 3. What is doing in places remote from them. On these several occasions they use several peculiar ceremonies, and place themselves in various odd postures as they beat the drum; which influences the rings to the one or the other side, and to come nearer to the one or the other set of figures. And when they have done this, they have a method of calculating a discovery, which they keep as a great secret, but which seems merely the business of the imagination in the diviner or magician.

Magic Square, a square figure, formed of a series of numbers in mathematical proportion; so disposed in parallel and equal ranks, as that the sums of each row, taken either perpendicularly, horizontally, or diagonally, are equal.

Let the several numbers which compose any square number (for instance, 1, 2, 3, 4, 5, &c. to 25 inclusive, the square number) be disposed, in their natural order, after each other in a square figure of 25 cells, each in its cell; if now you change the order of these numbers, and dispose them in the cells in such manner, as that the five numbers which fill an horizontal rank of cells, being added together, shall make the same sum with the five numbers in any other rank of cells, whether

horizontal or vertical, and even the same number with the five in each of the two diagonal ranks: this disposition of numbers is called a *magic square*, in opposition to the former disposition, which is called a *natural square*. See the figures following:

Natural square.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Magic square.

16	14	8	2	25
3	22	20	11	9
15	6	4	23	17
24	18	12	10	1
7	5	21	19	13

One would imagine that these magic squares had that name given them in regard this property of all their ranks, which, taken any way, make always the same sum, appeared extremely surprising, especially in certain ignorant ages, when mathematics passed for magic; but there is a great deal of reason to suspect, that these squares merited their name still farther, by the superstitious operations they were employed in, as the construction of talismans, &c. for, according to the childish philosophy of those days, which attributed virtues to numbers, what virtues might not be expected from numbers so wonderful?

However, what was at first the vain practice of makers of talismans and conjurers, has since become the subject of a serious research among mathematicians; not that they imagine it will lead them to any thing of solid use or advantage. Magic squares favour too much of their original to be of much use; but only as it is a kind of play, where the difficulty makes the merit, and it may chance to produce some new views of numbers, which mathematicians will not lose the occasion of.

Eman. Moschopolus, a Greek author of no great antiquity, is the first that appears to have spoken of magic squares: and by the age wherein he lived, there is reason to imagine he did not look on them merely as a mathematician. However, he has left us some rules for their construction. In the treatise of Cor. Agrippa, so much accused of magic, we find the squares of seven numbers, viz. from three to nine inclusive, disposed magically; and it must not be supposed that those seven numbers were preferred to all the other without some very good reason: in effect, it is because their squares, according to the system of Agrippa and his followers, are planetary. The square of 3, for instance, belongs to Saturn; that of 4 to Jupiter; that of 5 to Mars; that of 6 to the Sun; that of 7 to Venus; that of 8 to Mercury; and that of 9 to the Moon. M. Bachet applied himself to the study of magic squares, on the hint he had taken from the planetary squares of Agrippa, as being unacquainted with the work of Moschopolus, which is only in manuscript in the French king's library; and, without the assistance of any author, he found out a new method for those squares whose root is uneven, for instance 25, 49, &c. but he could not make any thing of those whose root is even.

After him came M. Frenicle, who took the same subject in hand. A certain great algebraist was of opinion, that whereas the 16 numbers which compose the square might be disposed 20922789888000 different ways in a natural square (as from the rules of com-

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Square.

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Square.

bination it is certain they may), they could not be disposed in a magic square above 16 different ways; but M. Frenicle showed, that they might be thus disposed 878 different ways: whence it appears how much his method exceeds the former, which only yielded the 55th part of magic squares of that of M. Frenicle.

To this inquiry he thought fit to add a difficulty that had not yet been considered: the magic square of 7, for instance, being constructed, and its 49 cells filled, if the two horizontal ranks of cells, and, at the same time, the two vertical ones, the most remote from the middle, be retrenched; that is, if the whole border or circumference of the square be taken away, there will remain a square whose root will be 5, and which will only consist of 25 cells. Now it is not at all surprising that the square should be no longer magical, because the ranks of the large ones were not intended to make the same sum, excepting when taken entire with all the seven numbers that fill their seven cells; so that being mutilated each of two cells, and having lost two of their numbers, it may be well expected, that their remainders will not any longer make the same sum. But M. Frenicle would not be satisfied, unless when the circumference or border of the magic square was taken away, and even any circumference at pleasure, or, in fine, several circumferences at once, the remaining square was still magical: which last condition, no doubt, made these squares vastly more magical than ever.

Again, he inverted that condition, and required that any circumference taken at pleasure, or even several circumferences, should be inseparable from the square; that is, that it should cease to be magical when they were removed, and yet continue magical after the removal of any of the rest. M. Frenicle, however, gives no general demonstration of his methods, and frequently seems to have no other guide but chance. It is true, his book was not published by himself, nor did it appear till after his death, *viz.* in 1693.

In 1703, M. Poignard, canon of Brussels, published a treatise of sublime magic squares. Before him there had been no magic squares made but for serieses of natural numbers that formed a square; but M. Poignard made two very considerable improvements.

1. Instead of taking all the numbers that fill a square, for instance the 36 successive numbers, which would fill all the cells of a natural square, whose side is 6, he only takes as many successive numbers as there are units in the side of the square, which, in this case, are six; and these six numbers alone he disposes in such manner in the 36 cells that none of them are repeated twice in the same rank, whether it be horizontal, vertical, or diagonal; whence it follows, that all the ranks, taken all the ways possible, must always make the same sum, which M. Poignard calls repeated progression. 2. Instead of being confined to take these numbers according to the series and succession of the natural numbers, that is, in an arithmetical progression, he takes them likewise in a geometrical progression, and even in an harmonical progression. But with these two last progressions the magic must necessarily be different to what it was: in the squares filled with numbers in

geometrical progression, it consists in this, that the products of all the ranks are equal; and in the harmonical progression, the numbers of all the ranks continually follow that progression. he makes squares of each of these three progressions repeated.

This book of M. Poignard gave occasion to M. de la Hire to turn his thoughts the same way, which he did with such success, that he seems to have well nigh completed the theory of magic squares. He first considers uneven squares: all his predecessors on the subject having found the construction of even ones by much the most difficult; for which reason M. de la Hire reserves those for the last. This excess of difficulty may arise partly from hence, that the numbers are taken in arithmetical progression. Now in that progression, if the number of terms be uneven, that in the middle has some properties, which may be of service; for instance, being multiplied by the number of terms in the progression, the product is equal to the sum of all the terms.

M. de la Hire proposes a general method for uneven squares, which has some similitude with the theory of compound motions, so useful and fertile in mechanics. As that consists in decomposing motions, and resolving them into others more simple; so does M. de la Hire's method consist in resolving the square that is to be constructed into two simple and primitive squares. It must be owned, however, it is not quite so easy to conceive those two simple and primitive squares in the compound or perfect square, as in an oblique motion to imagine a parallel and perpendicular one.

Suppose a square of cells, whose root is uneven, for instance 7; and that its 49 cells are to be filled magically with numbers, for instance the first 7. M. de la Hire, on the one side, takes the first 7 numbers, beginning with unity, and ending with the root 7; and on the other 7, and all its multiples to 49, exclusively; and as these only make six numbers, he adds c, which makes this an arithmetical progression of 7 terms as well as the other; 0. 7. 14. 21. 28. 35. 42. This done, with the first progression repeated, he fills the square of the root 7 magically: In order to this, he writes in the first seven cells of the first horizontal rank the seven numbers proposed in what order he pleases, for that is absolutely indifferent; and it is proper to observe here, that those seven numbers may be ranged in 5040 different manners in the same rank. The order in which they are placed in the first horizontal rank, be it what it will, is that which determines their order in all the rest. For the second horizontal rank, he places in its first cell, either the third, the fourth, the fifth, or the sixth number, from the first number of the first rank; and after that writes the six others in order as they follow. For the third horizontal rank, he observes the same method with regard to the second that he observed in the second with regard to the first, and so of the rest. For instance, suppose the first horizontal rank filled with the seven numbers in their natural order, 1, 2, 3, 4, 5, 6, 7; the second horizontal rank may either commence with 3, with 4, with 5, or with 6: but in this instance it commences with 3; the third rank therefore must com-

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Square.

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Square.

1	2	3	4	5	6	7
3	4	5	6	7	1	2
5	6	7	1	2	3	4
7	1	2	3	4	5	6
2	3	4	5	6	7	1
4	5	6	7	1	2	3
6	7	1	2	3	4	5

mence with 5, the fourth with 7, the fifth with 2, the sixth with 4, and the seventh with 6. The commencement of the ranks which follow the first being thus determined, the other numbers, as we have already observed, must be writ-

ten down in the order wherein they stand in the first, going on to 5, 6, and 7, and returning to 1, 2, &c. till every number in the first rank be found in every rank underneath, according to the order arbitrarily pitched upon at first. By this means it is evident, that no number whatever can be repeated twice in the same rank; and by consequence, that the seven numbers 1, 2, 3, 4, 5, 6, 7, being in each rank, must of necessity make the same sum.

It appears, from this example, that the arrangement of the numbers in the first rank being chosen at pleasure, the other ranks may be continued in four different manners: and since the first rank may have 5040 different arrangements, there are no less than 20160 different manners of constructing the magic square of seven numbers repeated.

1	2	3	4	5	6	7
2	3	4	5	6	7	1
3	4	5	6	7	1	2
4	5	6	7	1	2	3
5	6	7	1	2	3	4
6	7	1	2	3	4	5
7	1	2	3	4	5	6

1	2	3	4	5	6	7
7	1	2	3	4	5	6
6	7	1	2	3	4	5
5	6	7	1	2	3	4
4	5	6	7	1	2	3
3	4	5	6	7	1	2
2	3	4	5	6	7	1

The order of the numbers in the first rank being determined; if in beginning with the second rank, the second number 2, or the last number 7, should be pitched upon, in one of those cases and repeated; and in the other case, the other diagonal would be false unless the number repeated seven times should happen to be 4; for four times seven is equal to the sum of 1, 2, 3, 4, 5, 6, 7: and in general, in every square consisting of an unequal number of terms, in arithmetical progression, one of the diagonals would be false according to those two constructions, unless the term always repeated in that diagonal were the middle term of the progression. It is not, however, at all necessary to take the terms in an arithmetical progression; for, according to this method, one may construct a magic square of any numbers at pleasure, whether they be according to any certain progression or not. If they be in an arithmetical progression, it will be proper, out of the general method, to except those two constructions which produce a continual repetition of the same term in one of the two diagonals, and only to take in the case wherein that repetition would prevent the diagonal from being just; which case being absolutely disregarded when we computed that the square of 7 might have 20,160 different constructions, it is evident that by taking that case in it must have vastly more.

To begin the second rank with any other number

besides the second and the last, must not, however, be looked on as an universal rule: it holds good for the square of 7; but if the square of 9, for instance, were to be constructed, and the fourth figure of the first horizontal rank were pitched on for the first of the second, the consequence would be, that the fifth and eighth horizontal ranks would likewise commence with the same number, which would therefore be repeated three times in the same vertical rank, and occasion other repetitions in all the rest. The general rule, therefore, must be conceived thus: Let the number in the first rank pitched on, for the commencement of the second, have such an exponent of its quota; that is, let the order of its place be such, as that if an unit be taken from it, the remainder will not be any just quota part of the root of the square; that is, cannot divide it equally. If, for example, in the square of 7, the third number of the first horizontal rank be pitched on for the first of the second, such construction will be just; because the exponent of the place of that number, viz. 3, subtracting 1, that is, 2 cannot divide 7. Thus also might the fourth number of the same first rank be chosen, because 4—1, viz. 3, cannot divide 7; and, for the same reason, the fifth or sixth number might be taken: but in the square of 9, the fourth number of the first rank must not be taken, because 4—1, viz. 3, does divide 9. The reason of this rule will appear very evidently, by considering in what manner the returns of the same numbers do or do not happen, taking them always in the same manner in any given series. And hence it follows, that the fewer divisions the root of any square to be constructed has, the more different manners of constructing it there are; and that the prime numbers, i. e. those which have no divisions, as 5, 7, 11, 13, &c. are those whose squares will admit of the most variations in proportion to their quantities.

The squares constructed according to this method have some particular properties not required in the problem; for the numbers that compose any rank parallel to one of the two diagonals, are ranged in the same order with the numbers that compose the diagonal to which they are parallel. And as any rank parallel to a diagonal must necessarily be shorter, and have fewer cells than the diagonal itself, by adding to it the correspondent parallel, which has the number of cells by which the other falls short of the diagonal, the numbers of those two parallels, placed as it were end to end, still follow the same

First Primitive.

1	2	3	4	5	6	7
3	4	5	6	7	1	2
5	6	7	1	2	3	4
7	1	2	3	4	5	6
2	3	4	5	6	7	1
4	5	6	7	1	2	3
6	7	1	2	3	4	5

order with those of the diagonal: besides that their sums are likewise equal; so that they are magical on another account. Instead of the squares, which we have hitherto formed by horizontal ranks, one might also form them by vertical ones; the case is the same in both.

All we have hitherto said regards only the first primitive square, whose numbers, in the proposed example, were 1, 2, 3, 4, 5, 6, 7; here still remains the second

Magic
Square.

Magic
Square.

Second Primitive.

0	7	14	21	28	35	42
21	28	35	42	0	7	14
42	0	7	14	21	28	35
14	21	28	35	42	0	7
35	42	0	7	14	21	28
7	14	21	28	35	42	0
28	35	42	0	7	14	21

second primitive, whose numbers are 0, 7, 14, 21, 28, 35, 42. M. de la Hire proceeds in the same manner here as in the former; and this may likewise be constructed in 20,160 different manners, as containing the same number of terms with the first. Its construction being made, and of consequence

all its ranks making the same sum, it is evident, that if we bring the two into one, by adding together the numbers of the two corresponding cells of the two squares, that is, the two numbers of the first of each, the two numbers of the second, of the third, &c. and dispose them in the 49 corresponding cells of a third square, it will likewise be magical in regard to its rank, formed by the addition of equal sums to equal sums, which must of necessity be equal among themselves. All that remains in doubt is, whether or no, by the addition of the corresponding cells of the two first squares, all the cells of the third will be filled in such manner, as that each not only contains one of the numbers of the progression from 1 to 49, but also that this number be different from any of the rest, which is the end and design of the whole operation.

As to this it must be observed, that if in the construction of the second primitive square care has been taken, in the commencement of the second horizontal rank, to observe an order with regard to the first different from what was observed in the construction of the first square; for instance, if the second rank of

Perfect Square.

1	9	17	25	33	41	49
24	32	40	48	7	8	16
47	6	14	15	23	31	39
21	22	41	38	46	5	13
37	47	4	12	20	28	29
11	19	27	35	36	45	3
34	42	43	2	10	18	26

the first square began with the third term of the first rank, and the second rank of the second square commence with the fourth of the first rank, as in the example it actually does; each number of the first square may be combined once, and only once, by addition with all the numbers of the second.

And as the numbers of the first are here 1, 2, 3, 4, 5, 6, 7, and those of the second, 0, 7, 14, 21, 28, 35, 42, by combining them in this manner we have all the numbers in the progression from 1 to 49, without having any of them repeated; which is the perfect magic square proposed.

The necessity of constructing the two primitive squares in a different manner does not at all hinder but that each of the 20,160 constructions of the one may be combined with all the 20,160 constructions of the other: of consequence, therefore, 20,160 multiplied by itself, which makes 406,425,600, is the number of different constructions that may be made of the perfect square, which here consists of the 49 numbers of the natural progression. But as we have already observed, that a primitive square of seven numbers repeated may have above 20,160 several constructions, the number 406,425,600 must come vastly short of expressing all the possible constructions of a perfect magic square of the 49 first numbers.

As to the even squares, he constructs them like the uneven ones, by two primitive squares; but the con-

struction of primitives is different in general, and may be so a great number of ways: and those general differences admit of a great number of particular variations, which give as many different constructions of the same even square. It scarce seems possible to determine exactly, either how many general differences there may be between the construction of the primitive squares of an even square and an uneven one, nor how many particular variations each general difference may admit of; and, of consequence, we are still far from being able to determine the number of different constructions of all those that may be made by the primitive squares.

The ingenious Dr Franklin seems to have carried this curious speculation farther than any of his predecessors in the same way. He has constructed not only a magic square of squares, but likewise a magic circle of circles, of which we shall give some account for the amusement of our readers. The magic square of squares is formed by dividing the great square, as in

Plate 294. fig. 1. The great square is divided into 256 small squares, in which all the numbers from 1 to 256 are placed in 16 columns, which may be taken either horizontally or vertically. The properties are as follow:

1. The sum of the 16 numbers in each column, vertical and horizontal, is 2056.
2. Every half column, vertical and horizontal, makes 1028, or half of 2056.
3. Half a diagonal ascending added to half a diagonal descending, makes 2056; taking these half diagonals from the ends of any side of the square to the middle thereof; and so reckoning them either upward or downward, or sidewise from left to right hand, or from right to left.
4. The same, with all the parallels to the half diagonals, as many as can be drawn in the great square: for any two of them being directed upward and downward, from the place where they begin to that where they end, their sums will make 2056. The same downward and upward in like manner: or all the same if taken sideways to the middle, and back to the same side again. N. B. One set of these half diagonals and their parallels is drawn in the same square upward and downward. Another such set may be drawn from any of the other three sides.

5. The four corner numbers in the great square, added to the four central numbers therein, make 1028; equal to the half sum of any vertical or horizontal column which contains 16 numbers; and equal to half a diagonal or its parallel.

6. If a square hole (equal in breadth to four of the little squares) be cut in a paper, through which any of the 16 little squares in the great square may be seen, and the paper be laid on the great square, the sum of all the 16 numbers, seen through the hole, is equal to the sum of the 16 numbers in any horizontal or vertical column, viz. to 2056.

The magic circle of circles (fig. 2.) is composed of a series of numbers from 12 to 75 inclusive, divided into eight concentric circular spaces, and ranged in eight radii of numbers, with the number 12 in the centre; which number, like the centre, is common to all these circular spaces, and to all the radii.

Magic
Square.

Magic Square.

The numbers are so placed, that the sum of all those in either of the concentric circular spaces above mentioned, together with the central number 12, make 360; equal to the number of degrees in a circle.

The numbers in each radius also, together with the central number 12, make just 360.

The numbers in half of any of the above circular spaces, taken either above or below the double horizontal line, with half the central number 12, make 180; equal to the number of degrees in a semicircle.

If any four adjoining numbers be taken, as if in a square, in the radial divisions of these circular spaces, the sum of these, with half the central number, make 180.

There are, moreover, included, four sets of other circular spaces, bounded by circles which are eccentric with respect to the common centre; each of these sets containing five spaces. The centres of the circles which bound them are at A, B, C, and D. The set whose centre is at A is bounded by dotted lines; the set whose centre is at C is bounded by lines of short unconnected strokes; and the set round D is bounded by lines of unconnected longer strokes, to distinguish them from one another. In drawing this figure by hand, the set of concentric circles should be drawn with black ink, and the four different sets of eccentric circles with four kinds of ink of different colours; as blue, red, yellow, and green, for distinguishing them readily from one another. These sets of eccentric circular spaces intersect those of the concentric, and each other; and yet the numbers contained in each of the eccentric spaces, taken all around through any of the 20 which are eccentric, make the same sum as those in the concentric, namely 360, when the central number 12 is added. Their halves also, taken above or below the double horizontal line, with half the central number, make 180.

Observe, that there is not one of the numbers but what belongs at least to two of the circular spaces, some to three, some to four, some to five; and yet they are all so placed as never to break the required number 360 in any of the 28 circular spaces within the primitive circle.

To bring these matters in view, all the numbers as above mentioned are taken out, and placed in separate columns as they stand around both the concentric and eccentric circular spaces, always beginning with the outermost and ending with the innermost of each set, and also the numbers as they stand in the eight radii, from the circumference to the centre; the common central number 12 being placed the lowest in each column.

1. In the eight concentric circular spaces.

14	72	23	65	21	67	12	74
25	63	16	70	18	68	27	61
30	56	39	49	37	51	28	58
41	47	32	54	34	52	43	45
46	40	55	33	53	35	44	42
57	31	48	38	50	36	59	29
62	24	71	17	69	19	60	26
73	15	64	22	66	20	75	13
12	12	12	12	12	12	12	12
360	360	360	360	360	360	360	360

2. In the eight radii.

14	25	30	41	46	57	62	73
72	63	56	47	40	31	24	15
23	16	39	32	55	48	71	64
65	70	49	54	33	38	17	22
31	18	37	34	53	50	69	66
67	68	51	52	35	36	19	20
12	27	28	43	44	59	60	75
74	61	58	45	42	29	26	13
12	12	12	12	12	12	12	12
360	360	360	360	360	360	360	360

Magic Square.

3. In the five eccentric circular spaces whose centre is at A.

14	72	23	85	21
63	16	70	18	68
39	49	37	51	28
54	34	52	43	45
33	53	35	44	42
48	38	50	36	59
24	71	17	69	19
73	15	64	22	66
12	12	12	12	12
360	360	360	360	360

4. In the five eccentric circular spaces whose centre is at B.

30	56	39	49	37
47	32	54	34	52
55	33	53	35	44
38	50	36	59	29
17	69	19	60	26
64	22	66	20	75
72	23	65	21	67
25	63	16	70	18
12	12	12	12	12
360	360	360	360	360

5. In the five eccentric circular spaces whose centre is at C.

46	40	55	33	53
31	48	38	50	36
71	17	69	19	60
22	66	20	75	13
65	21	67	12	74
16	70	18	68	27
56	39	49	37	51
41	47	32	54	34
12	12	12	12	12
360	360	360	360	360

6. In the five eccentric circular spaces whose centre is at D.

62	24	71	17	69
15	64	22	66	20
23	65	21	67	12
70	18	68	27	61
49	37	51	28	58
32	54	34	52	43
40	55	33	53	35
57	31	48	38	50
12	12	12	12	12
360	360	360	360	360

If, now, we take any four numbers, as in a square form, either from N° 1. N° 2. (as we suppose from N° 1.) as in the margin, and add half the central number 12 to them,

14 72
25 63
6
the

Magic
Lantern.
||
Magliabe-
chi.

the sum will be 180; equal to half the numbers in any circular space taken above or below the double horizontal line, and equal to the number of degrees in a semicircle. Thus, 14, 72, 25, 63, and 6, make 180.

MAGIC Lantern. See DIOPTRICS, art. x, p. 37.

MAGICIAN, one who practices magic, or hath the power of doing wonderful feats by the agency of spirits.

Among the eastern nations it seems to have been formerly common for the princes to have magicians about their court to confer with upon extraordinary occasions. And concerning these there hath been much disputation: some supposing that their power was only feigned, and that they were no other than impostors who imposed on the credulity of their sovereigns; while others have thought that they really had some unknown connection or correspondence with evil spirits, and could by their means accomplish what otherwise would have been impossible for men. See the article MAGIC.

MAGINDANAO, or MINDANAO. See MINDANAO.

MAGISTRY, in chemistry, a name given to almost all precipitates. Thus, *magistry* and *precipitate* are synonymous: but chemists chiefly use *precipitates* as a general term, and apply that of *magistry* to some particular precipitates only which are used in medicine and in the arts. Such are, the magisteries of bismuth, coal, crabs-eyes, sulphur, &c.

MAGISTRY of Bismuth. See CHEMISTRY, n° 766.

MAGISTRATE, any public officer to whom the executive power of the law is committed either wholly or in part.

MAGLIABECHI (Antony), a person of great learning, and remarkable for an amazing memory, was born at Florence in 1633. His father died when he was only seven years old. His mother had him taught grammar and drawing, and then put him apprentice to one of the best goldsmiths in Florence. When he was about 16 years old, his passion for learning began to show itself; and he laid out all his money in buying books. Becoming acquainted with Michael Ermini, librarian to the cardinal de Medicis, he soon perfected himself by his assistance in the Latin tongue, and in a little time became master of the Hebrew. His name soon became famous among the learned. A prodigious memory was his distinguishing talent; and he retained not only the sense of what he had read, but frequently all the words, and the very manner of spelling. It is said that a gentleman, to make trial of the force of his memory, lent him a manuscript he was going to print. Some time after it was returned, the gentleman, coming to him with a melancholy countenance, pretended it was lost, and requested Magliabechi to recollect what he remembered of it; upon which he wrote the whole, without missing a word. He generally shut himself up the whole day, and opened his doors in the evening to the men of letters who came to converse with him. His attention was so absorbed by his studies, that he often forgot the most urgent wants of nature. Cosmo III. grand duke of Florence, made him his librarian; but he still continued negligent in his dress, and simple in his manners. An old cloak served him for a morning-gown in the day and for bed-cloaths at night. The duke, however,

N° 191.

provided for him a commodious apartment in his palace, which he was with difficulty persuaded to take possession of; but which he quitted four months after, and returned to his house. He was remarkable for his extraordinary modesty, his sincerity, and his beneficence, which his friends often experienced in their wants. He was a patron of men of learning; and had the highest pleasure in assisting them with his advice and information, and in furnishing them with books and manuscripts. He had the utmost aversion at any thing that looked like constraint; and therefore the grand duke always dispensed with his personal attendance, and sent him his orders in writing. Though he lived a most sedentary life, he reached the 81st year of his age; and died in the midst of the public applause, after enjoying, during the latter part of his life, such affluence as few have ever procured by their learning. By his will, he left a very fine library to the public, with a fund for its support.

MAGLOIRE (St), a native of Wales in Great Britain, and cousin-german to St Sampson and St Mallo. He embraced a monastic life, and went into France, where he was made abbot of Dol, and after that a provincial bishop in Brittany. He afterwards founded a monastery in the island of Jersey, where he died on the 14th of October 575, about the age of 80. His remains were transported to the suburbs of St Jacques, and deposited in a monastery of Benedictines, which was ceded to the fathers of the oratory in 1628. It is now the seminary of St Magloire, celebrated on account of the learned men whom it has produced. This saint cultivated poetry with considerable success: the hymn which is sung at the feast of All Saints was composed by him; *Cælo quos eadem gloria consecrat*, &c.

MAGNA ASSISA ELIGENDA, is a writ anciently directed to the sheriff for summoning four lawful knights before the justices of assize, in order to choose 12 knights of the neighbourhood, &c. to pass upon the great assize between such a person plaintiff and such a one defendant.

MAGNA Charta. See CHARTA.

MAGNANIMITY, denotes greatness of mind, particularly in circumstances of trial and adversity.—Mr Stretch † well observes of it, that it is the good sense of pride, and the noblest way of acquiring applause. It renders the soul superior to the trouble, disorder, and emotion which the appearance of great danger might excite; and it is by this quality that heroes maintain their tranquillity, and preserve the free use of their reason in the most surprising and dreadful accidents. It admires the same quality in its enemy; and fame, glory, conquests, desire of opportunities to pardon and oblige their opposers, are what glow in the minds of the brave. Magnanimity and courage are inseparable.

1. The inhabitants of Privernum being subdued and taken prisoners after a revolt, one of them being asked by a Roman senator, who was for putting them all to death, what punishment he and his fellow captives deserved? answered with great intrepidity, "We deserve that punishment which is due to men who are jealous of their liberty, and think themselves worthy of it." Plautinus perceiving that his answer exasperated some of the senators, endeavoured to prevent the

Magloire
||
Magnanimity.

† Beauties
of History,
under
the word.

Magnanimity.

the ill effects of it, by putting a milder question to the prisoner: "How would you behave (says he) if Rome should pardon you?" "Our conduct (replied the generous captive) depends upon yours. If the peace you grant be an honourable one, you may depend on a constant fidelity on our parts: if the terms of it be hard and dishonourable, lay no stress on our adherence to you." Some of the judges construed these words as menaces; but the wiser part finding in them a great deal of magnanimity, cried out, that a nation whose only desire was liberty, and their only fear that of losing it, was worthy to become Roman. Accordingly, a decree passed in favour of the prisoners, and Privernum was declared a municipium. Thus the bold sincerity of one man saved his country, and gained it the privilege of being incorporated into the Roman state.

2. Subrius Flavius, the Roman tribune, being impeached for having conspired against the life of the emperor Nero, not only owned the charge, but gloried in it. Upon the emperor's asking him what provocation he had given him to plot his death? "Because I abhorred thee (said Flavius), though there was not in the whole army one more zealously attached to thee than I, so long as thou didst merit affection; but I began to hate thee when thou becamest the murderer of thy mother, the murderer of thy brother and wife, a charioteer, a comedian, an incendiary, and a tyrant." Tacitus tells us, that the whole conspiracy afforded nothing which proved so bitter and pungent to Nero as this reproach. He ordered Flavius to be immediately put to death, which he suffered with amazing intrepidity. When the executioner desired him to stretch out his neck valiantly, "I wish (replied he) thou mayest strike as valiantly."

3. When the Scythian ambassadors waited on Alexander the Great, they gazed attentively upon him for a long time without speaking a word, being very probably surprised, as they formed a judgment of men from their air and stature, to find that he did not answer the high idea they entertained of him from his fame. At last, the oldest of the ambassadors (according to Q. Curtius) addressed him thus: "Had the gods given thee a body proportionable to thy ambition, the whole universe would have been too little for thee. With one hand thou wouldst touch the east, and with the other the west; and, not satisfied with this, thou wouldst follow the sun, and know where he hides himself. But what have we to do with thee? we never set foot in thy country. May not those who inhabit woods be allowed to live, without knowing who thou art, and whence thou comest? We will neither command over, nor submit to, any man. And that thou mayest be sensible what kind of people the Scythians are, know, that we received from heaven as a rich present, a yoke of oxen, a ploughshare, a dart, a javelin, and a cup. These we make use of, both with our friends and against our enemies. To our friends we give corn, which we procure by the labour of our oxen; with them we offer wine to the gods in our cup; and with regard to our enemies, we combat them at a distance with our arrows, and near at hand with our javelins. But thou, who boastest thy coming to extirpate robbers, thou thyself art the greatest robber

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upon earth. Thou hast plundered all nations thou overcamest: thou hast possessed thyself of Lydia, invaded Syria, Persia, and Bactriana; thou art forming a design to march as far as India; and now thou comest hither to seize upon our herds of cattle. The great possessions thou hast, only make thee covet more eagerly what thou hast not. If thou art a god, thou oughtest to do good to mortals, and not deprive them of their possessions. If thou art a mere man, reflect always on what thou art. They whom thou shalt not molest will be thy true friends, the strongest friendships being contracted between equals; and they are esteemed equals who have not tried their strength against each other: but do not imagine that those whom thou conquerest can love thee."

4. Richard I. king of England, having invested the castle of Chalus, was shot in the shoulder with an arrow; an unskilful surgeon endeavouring to extract the weapon, mangled the flesh in such a manner, that a gangrene ensued. The castle being taken, and perceiving he should not live, he ordered Bertram de Gourdon, who had shot the arrow, to be brought into his presence. Bertram being come, "What harm (said the king) did ever I do thee, that thou shouldst kill me?" The other replied with great magnanimity and courage, "You killed with your own hand my father and two of my brothers, and you likewise designed to have killed me. You may now satiate your revenge. I should cheerfully suffer all the torments that can be inflicted, were I sure of having delivered the world of a tyrant who filled it with blood and carnage." This bold and spirited answer struck Richard with remorse. He ordered the prisoner to be presented with one hundred shillings, and set at liberty; but Maccardee, one of the king's friends, like a true ruffian, ordered him to be flayed alive.

5. The following modern instance is extracted from a late French work intitled, *Ecole historique & morale du soldat*, &c. A mine, underneath one of the outworks of a citadel, was intrusted to the charge of a serjeant and a few soldiers of the Piedmontese guards. Several companies of the enemy's troops had made themselves masters of this work; and the loss of the place would probably soon have followed had they maintained their post in it. The mine was charged, and a single spark would blow them all into the air. The serjeant, with the greatest coolness, ordered the soldiers to retire, desiring them to request the king to take care of his wife and children; struck fire, set a match to the train, and sacrificed himself for his country.

MAGNESA, or MAGNESIA, (anc. geog.) a town or a district of Thessaly, at the foot of mount Pelius, called by Philip, the son of Demetrius, one of the three keys of Greece, (Pausanias.)

MAGNESIA, or MAGNESIA ALBA, in mineralogy and chemistry, a kind of earth only discovered since the beginning of this century. It first began to be known at Rome by the name of the *Count de Palma's powder*, which a canon there offered as a general remedy for all disorders. It was by many considered as a calcareous earth; but F. Hoffman showed it to be essentially distinct. The same was afterwards done by

3 H

Dr

Magnanimity
||
Magnesia.Rapin's Hist
an. 1199

Magnesia.

Dr Black of Edinburgh and M. Margraaf of Berlin, though unknown to each other at the time. When pure, it is extremely white, loose, and light; the specific gravity about 2.330. It is one of the most infusible substances in nature; neither melting, nor even hardening nor contracting, in the focus of the most powerful burning-glass. An experiment was made on some of this earth in the summer of 1782 by M. Magellan, with Mr Parker's burning-glass; the effects of which are more powerful than those of any other, though its diameter is only 32 inches. The event seemed at first to be unfavourable to the conclusion above mentioned; for a cubic inch of magnesia, a quarter of an inch each side, being put into its focus, was hardened, and reduced to less than a third part of its bulk each way, viz. from .25 of an inch to .08. On applying a similar cube of magnesia, however, from Mr Henry's manufacture at Manchester, it neither became harder nor sensibly diminished in size. Bergman informs us, that magnesia, unless precipitated by the volatile alkali, or that by the neat alkalised tartar, always contains some siliceous or calcareous earth. Almost the same thing happens when it is separated by calcination from the remaining lixiviations of the nitrous and marine acids; in which case, by such a violent fire, it adheres together, and even shows a tendency to vitrify.

Notwithstanding this extreme refractoriness of magnesia by itself, it melts easily with borax, though scarce affected by alkalies or the calces of lead; when mixed with other earths it produces hard masses of various kinds; when mixed with calcareous, argillaceous, or siliceous earths, it melts in the fire; and if four times its weight of green glass be added to it, the mass forms a kind of porcelain so hard as to strike fire with steel. But neither an equal part of the above earths, nor of ponderous earth, glass of lead, vegetable alkali, nor vitriolated tartar, added separately to magnesia, will melt in the fire: however, when mixed with common argillaceous earth, it melts into a hard mass. Magnesia differs from calcareous earth in having a much smaller attraction for fixed air. In this respect it is inferior even to fixed alkaline salts; so that it will not render any of these caustic, though it will do so to the volatile alkali. It also parts very readily with its own fixed air by mere heat; and it was by making experiments on this substance that Dr Black made his first discoveries concerning fixed air. In its calcined state, however, it does not show any of the causticity of lime, but may be safely taken internally; and is even preferred by some to that which contains fixed air. In this state it is much less soluble than when combined with fixed air, and does not effervesce with any acid. When mixed with water, a very small degree of heat is excited, and in about 7962 times its weight of water it totally dissolves. It dissolves also very readily in aerial acid; by which means it is frequently united with fresh water. For the same reason, when we mix a solution of perfectly mild alkali, either fixed or volatile, with a solution of magnesia, no precipitation follows; because the great quantity of fixed air extricated by the union of the acid and alkali, instantly dissolves the precipitate as fast as it is formed. But if we put this mixture over the fire, it will grow thick, and coagulate as soon as it is heated to a cer-

tain degree; because the magnesia is unable to retain, in any considerable heat, as much fixed air as is necessary for its solution.

On putting magnesia into water, and afterwards drying it, it is found to retain $\frac{1}{100}$ of its weight of aqueous fluid; but when fully saturated with aerial acid, it will absorb and retain $\frac{6}{100}$ of the same. When fully saturated with aerial acid, it is more soluble in cold than in hot water; because the heat of the latter dissipates part of the fixed air, as was observed concerning the alkaline salts.

Magnesia, when combined with different acids, forms salts exceedingly different from those produced by calcareous earth under similar circumstances; and of which an account is given under the article CHEMISTRY. It is usually prepared either from the bittern of sea-salt, or from the salt prepared from that liquid under the name of Epsom salt. The magnesia prepared directly from the bittern, however, is by no means equal in purity to that produced from the finer kinds of Epsom salt. Hence, in order to have pure magnesia, Bergman gives the following directions: "Let Epsom salt, in well-formed crystals, be dissolved in distilled water; and from this the magnesia is to be precipitated by mild volatile alkali. Some of this earth that remains suspended in the solution, by means of aerial acid, may be easily precipitated by a simple ebullition. An hundred pounds of this magnesia, when rightly prepared, contains near 25 parts of fixed air, 30 of water, and 45 of pure earth. Its specific gravity is then 2.155. This method of preparation may answer very well for having a very pure magnesia; but when it is required to have it very light and spongy, which, by those who use it, is looked upon to be the only criterion of its goodness, we must use the following method:

Take any quantity of Epsom salt, dissolve it in boiling water, and filter the solution. Dissolve also half the quantity of good pearl-ash, and filter this solution. Both of these solutions ought to be somewhat diluted; and it will be proper to use twice the quantity of water which would fairly dissolve the salts. Mix the two solutions when nearly cold, and stir them very well together. Let the mixture stand for some hours until the precipitate has fallen to the bottom in form of a coarse gritty powder. Put the whole then into a clean copper kettle, under which a moderate fire is made. Stir the matter incessantly with a large wooden spatula, to prevent the powder from sticking to the bottom. As the mixture heats, the powder begins to lose its sandy appearance, and to increase greatly in quantity; so that, though at first the mixture was quite thin, with only a small portion of sandy matter amongst it, before it has attained the boiling heat it will be so thick that it can scarce be stirred. When the grittiness is quite gone, the matter must be put upon a filtering cloth, and warm water poured upon it till it runs insipid. The magnesia is then to be put upon chalk stones, which will absorb the greatest part of the moisture; and it may at last be fully dried in a stove.

Magnesia alba is a good absorbent; and undoubtedly to be preferred to crab's-eyes, on account of its purgative quality when united with an acid, which the other has not. It has been esteemed hurtful in bilious

Magnesia. lions habits where there is a disposition in the stomach contrary to acidity. This, however, according to Mr Henry, is doubtful: and where putrid bile is to be corrected, he thinks good purposes may be answered by taking magnesia with an acid in a state of effervescence; as the fixed air, thus extricated, will correct the putridity of the contents of the intestines, while they are at the same time evacuated downwards. He is also of opinion, that in cutaneous diseases it may enter the circulation in form of a neutral salt, and, by acting as a diaphoretic and diuretic, prove an excellent alterative.

For some medical purposes, magnesia is used in a calcined state; in which case it is deprived of its fixed air, and then it proves nearly as aperient as a double quantity of magnesia in its uncalcined state. Mr Henry is of opinion, that it may be useful in distensions of the bowels arising from flatus; that it may be successfully employed as a cathartic with patients labouring under the stone, who are using the lixivium saponaceum; and that, joined with warm aromatics, it may be of service in correcting the great flatulency which so much afflicts people of a gouty disposition. From several experiments made by the same author, it also appears that magnesia has a considerable antiseptic power. The like virtue he ascribes to all kinds of testaceous powders: whence he concludes, that medicines of this kind are by no means improper in fevers of a putrescent type; that where bile is suspected to be the cause of any putrid disease, those antiseptics should be prescribed which particularly impede its corruption; that, as calcined magnesia is a more powerful antiseptic than most other absorbents, it merits a preference to these; and that where an acid cacochymy prevails, magnesia or other absorbents, taken immediately before or after meal-time, may, by increasing the putrefactive fermentation of animal-food, be of very great service. He hath also found, that magnesia hath a power of promoting the solution of resinous gums in water; and thus we have an elegant and easy method of preparing aqueous tinctures from these substances. Such tinctures, however, are calculated only for extemporaneous prescription, as most of them deposit a sediment when they have been kept a week or two.

Black MAGNESIA. See MANGANESE.

MAGNESIA (anc. geog.), a maritime district of Thessaly, lying between the south part of the Sinus Thermaicus and the Pegasæus to the south, and to the east of the Pelasgiotis. *Magnetes*, the people. *Magnesium* and *Magnessus*, the epithet; (Horace).

MAGNESIA, a town of Asia Minor on the Mæander, about 15 miles from Ephesus. Themistocles died there: it was one of the three towns given him by Artaxerxes, with these words, "to furnish his table with bread." It is also celebrated for a battle which was fought there, 190 years before the Christian æra, between the Romans and Antiochus king of Syria. The forces of Antiochus amounted to 70,000 men according to Appian, or 70,000 foot and 12,000 horse according to Livy, which has been exaggerated by Florus to 300,000 men; the Roman army consisted of about 28 or 30,000 men, 2000 of which were employed in guarding the camp. The Syrians lost 50,000 foot and 4000 horse; and the Romans only

300 killed, with 25 horse. It was founded by a colony from Magnesia in Thessaly; and was commonly called *Magnesia ad Mæandrum*, to distinguish it from another, called *Magnesia ad Sipylum* in Lydia at the foot of mount Sipylus.

MAGNESIA ad Sipylum, anciently *Tantalus*, the residence of Tantalus, and capital of Mæonia, where now stands the lake Sale. A town of Lydia, at the foot of mount Sipylus, to the east of the Hermus; adjudged free under the Romans. It was destroyed by an earthquake in the reign of Tiberius.

MAGNET (*Magnes*), the **LOADSTONE**: a sort of ferruginous stone, in weight and colour resembling iron ore, though somewhat harder and more heavy; endowed with various extraordinary properties, attractive, directive, inclinatory, &c. See **MAGNETISM**.

The magnet is also called *Lapis Heracleus*, from Heraclea, a city of Magnesia, a port of the ancient Lydia, where it is said to have been first found, and from which it is usually supposed to have taken its name. Though others derive the word from a shepherd named *Magnes*, who first discovered it with the iron of his crook on mount Ida. It is also called *Lapis Nautilus*, by reason of its use in navigation; and *federites*, from its attracting iron, which the Greeks call *σίδηρον*.

The magnet is usually found in iron mines, and sometimes in very large pieces half magnet half iron. Its colour is different according to the different countries it is brought from. Norman observes, that the best are those brought from China and Bengal, which are of an iron or sanguine colour; those of Arabia are reddish; those of Macedonia blackish; and those of Hungary, Germany, England, &c. the colour of unwrought iron. Neither its figure nor bulk is determinate, it is found of all forms and sizes.

The ancients reckoned five kinds of magnets, different in colour and virtue; the Ethiopic, Magnesian, Bæotic, Alexandrian, and Natolian. They also took it to be male and female: but the chief use they made of it was in medicine; especially for the cure of burns and defluxions on the eyes.—The moderns, more happy, employ it to conduct them in their voyages. See **NAVIGATION**.

The most distinguishing properties of the magnet are, That it attracts iron, and that it points to the poles of the world; and in other circumstances also dips or inclines to a point beneath the horizon, directly under the pole; and that it communicates these properties, by touch, to iron. On which foundation are built the mariner's needles, both horizontal and inclinatory.

Attractive Power of the MAGNET was known to the ancients; and is mentioned even by Plato and Euripides, who call it the *Herculean stone*, because it commands iron, which subdues every thing else: but the knowledge of its directive power, whereby it disposes its poles along the meridian of every place, and occasions needles, pieces of iron, &c. touched with it, to point nearly north and south, is of a much later date; though the exact time of its discovery, and the discoverer himself, are yet in the dark. The first tidings we hear of it is in 1260, when Marco Polo the Venetian is said by some to have introduced the mariner's compass; tho' not as an invention of his own, but as derived

Magnet. ved from the Chinese, who are said to have had the use of it long before; though some imagine that the Chinese rather borrowed it from the Europeans.

Flavio de Gioia, a Neapolitan, who lived in the 13th century, is the person usually supposed to have the best title to the discovery: and yet Sir G. Wheeler mentions, that he had seen a book of astronomy much older, which supposed the use of the needle; though not as applied to the uses of navigation, but of astronomy. And in Guyot de Provins, an old French poet, who wrote about the year 1180, there is an express mention made of the loadstone and the com-

pass; and their use in navigation obliquely hinted at.

The Variation of the MAGNET, or its declination from the pole, was first discovered by Seb. Cabot, a Venetian, in 1500; and the variation of that variation, by Mr Gellibrand, an Englishman, about the year 1625. See VARIATION.

Lastly, the dip or inclination of the needle, when at liberty to play vertically, to a point beneath the horizon, was first discovered by another of our countrymen, Mr R. Norman, about the year 1576. See the article *Dipping-NEEDLE*.

MAGNETICAL NEEDLE. See *Magnetical NEEDLE*.

Magnet.

M A G N E T I S M;

THE power by which the loadstone is influenced, manifesting itself by certain attractive and directive virtues, and which may be understood from the following phenomena afterwards mentioned, which are common to all magnetical bodies.

CHAP. I. Phenomena and Laws of Magnetism.

§ 1. Phenomena of the Magnet.

1. A magnet, whether natural or artificial, attracts iron, and all substances which contain it in its metallic state. A pure calx of iron is but little attracted; but if the calx be heated strongly in conjunction with charcoal dust, it will then be attracted, though it has not regained its metallic splendour, and is quite destitute of malleability. The semimetal called *nickel*, and perhaps some others, are attracted by the magnet, though freed from iron as much as possible. From some accounts it has been suspected that brass was in a small degree affected by the magnet, and even that all very minute bodies are somewhat under its influence; but this seems not yet to be sufficiently ascertained.

2. If a magnet be suspended by a thread, nicely placed on a pivot, or set to float in a basin of water, it will turn one and constantly the same side nearly towards the north pole of the earth, the other of course turning towards the south. Hence these parts of the magnet have been called its poles, taking the designations of north and south from those parts of the world towards which they turn. This property is called the *polarity* of the magnet; and when it is in the act of turning itself into this position, it is said to *traverse*. A plane drawn perpendicular to the horizon through both poles of a magnet, after it has turned itself, is called the *magnetic meridian*; and the angle it makes with the meridian of the place is called the *declination* of the magnet or of the magnetic needle.

3. When either the north or the south poles of two magnets are placed near to each other, they repel; but a north and a south pole attract each other.

4. A magnet placed in such a manner as to be entirely at liberty, inclines one of its poles to the horizon, and of course elevates the other above it. This property is called the *inclination* or *dipping* of the magnet; and is most conspicuous in artificial magnets or needles, which may be accurately balanced before the magnetic virtue is imparted to them.

5. By proper management any magnet may be

made to communicate its virtue to a piece of steel or iron, which virtue it will retain for a longer or shorter time according to circumstances.

§ 2. Of the different Substances attracted by the Magnet.

It has already been said, that iron is the only substance which the magnet particularly attracts, and that too when in its metallic state. Nevertheless this metal is so universally diffused, that there are few substances which do not contain a sufficient quantity of it to be in some degree affected by the magnet. Iron itself is attracted with different degrees of force according to the state in which it is with regard to malleability.—Even the purest calx or solution that can be made, is said to be in some degree affected by the magnet; but of all substances soft iron is attracted with the greatest force when clean and of an uniform texture. Hardened steel is attracted with much less force than iron; but the scales separated from red-hot iron, the fused globules from flint and steel, or the finery cinder, are attracted as much as iron itself. The black calx of iron is attracted but very weakly; and the red calx or rust so little, that it is generally said to be quite insensible to the magnetic attraction; though this is not found to be strictly true, even when the calx is prepared by fire, and purified in the most careful manner. Sometimes the scales and calx are capable of acquiring a polarity, though weakly. Ores of iron are attracted with greater or less force according to the state of the metal in them, and according to the quantity of it they contain; though the attraction is always manifest even when they contain such a small quantity as scarcely to deserve the name of ores. They are generally much more attracted after calcination than before; because this operation communicates to them a portion of phlogiston by which they approach to a metallic state. Ores of lead, tin, and copper, are likewise attracted, as well as native cinnabar, on account of the quantity of iron they contain; and it is remarkable, that though pure lead in its metallic state is not in the least attracted, its calx is so in some degree. The calx of tin is also attracted, though in a still smaller degree than that of lead. Zinc, bismuth, and cobalt, but especially the ores of these semimetals, are attracted; but not antimony, unless it be first exposed to a gentle heat; and arsenic is not attracted at all. One kind of bismuth is said to be absolutely repelled by the magnet. Almost all other minerals are attracted, at least after having been exposed to the ac-

Substances
attracted
by the
Magnet.

tion of fire. Calcareous earth is attracted less than any other kind, and the siliceous earth the most frequently. Sand, especially the black kind, is generally attracted; and amber as well as other combustible substances have the same property, after being burned. Almost every part of animal and vegetable bodies is affected by the magnet after being burned; but unburned animal or vegetable substances are very seldom if ever perceptibly attracted. It is also remarkable, that even soot, or the dust which falls upon any thing left exposed to the atmosphere, are sensibly attracted. Colourless precious stones, as the diamond and crystals, are not attracted; neither the amethyst, topaz, chalcedony, or such as are deprived of their colour by fire; but all others, as the ruby, chrysolite, and tourmalin, are attracted. The emerald, and particularly the garnet, are not only attracted, but frequently acquire an evident polarity. The opal is attracted but weakly.

The attraction of so many different substances shows the universal diffusion of iron throughout almost all terrestrial substances; for to this we are with the greatest probability to ascribe the attraction of so many substances by the magnet. How small a quantity of iron indeed will give a substance this property, is evident from the following experiment related by Mr Cavallo. "Having chosen a piece of Turkey-stone which weighed above an ounce, I examined it by a very sensible magnet needle, but did not find that it was affected in the least. A piece of steel was then weighed with a pair of scales, which would turn with the 20th part of a grain, and one end of it drawn over the stone in various directions. After this operation the steel was again weighed, and found to have lost no perceptible part of its weight; yet the Turkey-stone, which had acquired only this very small quantity of steel, now affected the magnetic needle very sensibly." In making his observations on this experiment, he proposes the magnet as a test of iron in different substances, being capable of detecting a smaller quantity than any method that chemistry can yet afford.

Our author has been at considerable pains to investigate the magnetic properties of brass and other metals; having made many experiments upon the subject, of which the following are the results: 1. Hammered brass is much more generally attracted by the magnet than other kinds; and such as is not influenced in this manner, acquires the property by being hammered. 2. A piece of brass rendered magnetic by hammering, loses the property on being made red hot so as to become softened; by a second hammering it becomes again magnetic; and thus may be made to lose its property and recover it alternately. 3. Suspecting that the magnetic property might be occasioned by a small quantity of iron abraded from the hammer, the pieces of brass were beat between two pieces of card-paper; notwithstanding which precaution, it acquired the magnetic property as before. 4. Sometimes an evident degree of magnetism was communi-

cated by two or three strokes, and with the card-paper not above 30 strokes were given to make the brass sensibly magnetic. 5. A piece of brass was hardened by beating it between two large flints, using one for the hammer and the other for the anvil; but still it acquired a magnetic property, tho' less than with the iron hammer, which might be explained by the roughness of the flints, and their not coming into contact sufficiently with the metal. Neither of the flints was found to have acquired the smallest degree of magnetic power either before or after the experiment. 6. By melting the brass in a crucible, it was found to have entirely lost its magnetism. 7. A piece of brass deprived of its magnetic property by fire, regained it after a few strokes of the hammer, though laid between two pieces of copper. 8. Most of the pieces of brass tried by our author became magnetic by hammering; but some, though rendered equally hard with the rest, did not affect the needle in the least; but these could not originally be distinguished from such as are capable of becoming magnetic. 9. As, notwithstanding the precautions made use of in the above experiments to prevent the iron of the hammer from being in any manner of way communicated to the brass, an objection might arise, that some quantity of the calx might be diffused through the metal, and acquire phlogiston by hammering, he tried the following experiment, which seemed decisive. A piece of brass which would acquire no magnetism by hammering, was put upon an anvil with a considerable quantity of crocus martis, which had no effect upon the needle. It was then hammered for a long time, turning it frequently, so that the crocus was beat into the substance of the brass, and gave it a red colour; nevertheless, it affected the needle in this state no more than before. 10. A hole of about an eighth part of an inch in length, and little more than one 50th of an inch in diameter, was drilled in a piece of brass which could not be rendered magnetic by hammering; after which the hole was filled with crocus martis, and hammered as before, but still it showed no signs of magnetism (A). 11. On making this piece of brass, containing the crocus, red hot, it then affected the needle, but only in that place where the crocus was. 12. On repeating this experiment with black calx of iron instead of crocus martis, the brass was weakly attracted in that place where the calx was, and this attraction was neither augmented nor diminished by calcination. 13. On mixing a small quantity of iron with four times its weight of brass which could not be made magnetic by hammering, the whole was rendered powerfully magnetic; but on again mixing this compound with 50 times its weight of the same brass, the attraction became so weak as to be scarcely perceptible; and was neither augmented by hammering nor diminished by softening. 14. On repeating most of his experiments, by letting the pieces of brass float upon quicksilver in the manner hereafter described, he found that very few of them were not affected; and even the indifference of any of them did not seem to be-

Substances
attracted
by the
Magnet.

(A) These two experiments seem inconsistent with our author's assertion, that calces of iron are *always* affected in some degree by the magnet.

Substances
attracted
by the
Magnet.

be very well ascertained; though these did not acquire any additional magnetism by hammering.

From all these experiments Mr Cavallo draws the following conclusions. 1. Most brass becomes magnetic by hammering, and loses that property by annealing or softening in the fire; or at least its magnetism is so far weakened by it, as afterwards to be only discovered when floating on quicksilver. 2. The acquired magnetism is not owing to particles of iron naturally or artificially mixed with the brass. 3. The pieces of brass which have that property retain it without any diminution after a great number of repeated trials; but he found no method of giving magnetism to brass which had it not naturally. 4. A large piece of brass has generally a stronger magnetic power than a small one; and the flat surface draws the needle more powerfully than the edge or corner. 5. If only one end of a piece of brass be hammered, then that end alone will disturb the magnetic needle. 6. The magnetic power which brass acquires by hammering has a certain limit, beyond which it cannot be increased by farther hammering. This limit is different in different pieces of brass, according to their thickness or quality. 7. In the course of his experiments, the following circumstance was twice observed: A piece of brass which had the property of becoming magnetic by hammering, and of losing that property by annealing, lost its magnetic power entirely by being left in the fire till partially melted, but recovered it again on being fully so. 8. A long continuance in a strong fire, which alters the texture of the metal, making it what some workmen call *rotten*, generally destroys the magnetic property also; whence this property seems to be owing to some particular configuration of its parts. 9. When brass is used in magnetical instruments, it ought either to be left entirely soft, or chosen of such a sort as will not become magnetic by hammering. 10. There are few substances in nature, which, when floated upon quicksilver, are not affected in some degree by the magnet.

Our author next proceeded to try the magnetic power of other metals, particularly the component parts of brass, &c. copper, and zinc. With the former the result was doubtful; and though pieces of hammered copper would sometimes attract the needle, yet the attraction was always exceedingly weak. Zinc had no effect, either in its natural state or hammered as much as it could bear without breaking. A mixture of it with tin had no effect. The same was observed of a piece of a broken reflector of a telescope made of tin and copper; a mixture of tin, zinc, and copper; a piece of silver whether soft or hammered; a piece of pure gold whether soft or hammered; a mixture of gold and silver, both hard and soft; and another mixture of much silver, a little copper, and a still less quantity of gold.

The magnetic property of nickel has been mentioned by several authors; but Mr Cavallo says he has found some pieces which did not affect the needle in the least. "It is probable (says he) that these pieces were not pure nickel, and perhaps some cobalt was contained in them; but I see no reason why the nickel, when alloyed with a little cobalt, should show no attraction towards the magnet, if that property did

really and essentially belong to it." Our author, lastly, made several experiments upon platina; the magnetic properties of which were found to be very similar to those of brass; the native grains becoming magnetic by hammering, and losing that property by heat; but the precipitate from aqua-regia, fused in a violent fire, or rather concentered together by this means, showed no sign of attraction whatever.

§ 3. *Of the Attraction of the Magnet towards Iron in its various States of Existence.*

I. THE first experiment which naturally occurs on this subject is, Whether mere heat can make any change in the magnetic properties of iron without destroying its texture or diminishing the power of the magnet to which it is applied. Kircher says, that he tried this experiment, and found that a piece of iron heated to such a degree as to be scarcely discernible from a burning coal, was in that state as powerfully attracted as if it had been cold. Mr Cavallo found the effect directly the reverse; for, having heated a piece of steel red hot, and in that state presented it to the magnet, so as to touch it repeatedly in various places, not the least sign of attraction could be perceived. In this experiment, the redness of the iron could plainly be perceived in day-light; and our author acknowledges, that iron, tho' its redness be perceptible in the dark, will still be attracted by the magnet. The result was the same on repeating the experiment a number of times over; but the attraction became as strong as ever a little after the redness ceased in the dark. The attraction seemed to begin sooner in steel than in iron. Our author does not pretend to say, that by heating iron to a red, or even to a white heat, the attraction of the magnet for it is absolutely annihilated; but it certainly was so far diminished that it did not affect the magnetic needle.

II. It was now tried what would be the effect of decomposing iron; and with this view an earthen vessel, containing about two ounces of iron-filings, was placed near the south end of the needle of the compass, by which the latter was drawn a little out of its direction. On adding some water, and then vitriolic acid, the attraction seemed to be increased, and the needle came nearer the vessel. This superior attraction continued till the effervescence began to cease; and at last it was found to be inferior to what it had been originally. To obviate some objections which might arise from the motion of the iron-filings, the experiment was repeated with steel-wire twisted in various directions, so as to present a large surface to the acid; and being placed at a proper distance from the needle, it attracted it out of its direction from 281° to 280° . After adding the diluted vitriolic acid, a strong effervescence ensued, and the needle was moved to $279^{\circ} 47'$; five minutes after that it stood at $279^{\circ} 35'$; and in five minutes more at $279^{\circ} 33'$; seeming even to come somewhat nearer in a little time after: but as it then appeared to have gained its maximum of attraction, the pot was removed, and the needle went back to its original station of 281° .

On repeating this experiment with different acids, it was found that the vitriolic increased the attraction more than either the nitrous or marine. With the former of these the maximum of attraction was sooner gained

Attraction
towards
Iron.

Degrees, &c. of Attraction. gained and sooner lost than with the rest; and with marine acid the attraction was weakest of all; which, however, our author imputes to his not being able to raise a sufficient effervescence with this acid.

III. The degree of magnetic attraction depends upon the strength of the magnet itself, the weight and shape of the iron presented to it, the magnetic or unmagnetic state of the body, and the distance between them. A piece of clean and soft iron is more powerfully attracted than any other ferruginous substance of the same size and shape. Steel is attracted less powerfully. The attraction is strongest at the poles, diminishing according to the distance from them, and entirely ceasing at the equator or middle point betwixt the poles. It is strongest near the surface of the magnet, diminishing as we recede from it; but the proportion in which this diminution takes place has not been exactly determined. M. Muschenbroeck made the following experiments in order to determine this point.

1. A cylindrical magnet, two inches long, and weighing 16 drams, was suspended by an accurate balance above a cylinder of iron exactly of the same shape and dimensions, and the degree of attraction betwixt the two measured by weights put into the opposite scale; the magnet being successively placed at different distances from the iron. The results were as follow:

Distance in inches.	Attraction in grains.
6	3
5	3½
4	4½
3	6
2	9
1	18
0	57

2. A spherical magnet of the same diameter with the cylindrical one, but of greater strength, was affixed to one of the scales of the balance, and the cylindrical magnet used in the former experiment placed upon the table with its south pole upwards, facing the north pole of the spherical magnet; when the attractions were found as follow:

Distance in inches.	Attraction in grains.
6	21
5	27
4	34
3	44
2	64
1	100
0	260

3. Changing the cylindrical magnet for the iron cylinder abovementioned, the result was as follows:

Distance in inches.	Attraction in grains.
6	7
5	9½
4	15
3	25
2	45
1	92
0	340

IV. Using a globe of iron of the same diameter with the magnet instead of the cylinder, the results were:

Distance in inches	Attraction in grains.
8	1
7	2
6	3½
5	6
4	9
3	16
2	30
1	64
0	290

In the experiments with the cylinder, it was found that the magnet attracted a shorter cylinder with less force, but in the same proportion.—From the others, it appears, that one magnet attracts another with less force than a piece of iron, but that the attraction begins from a greater distance; whence it must follow a different law of decrease.

IV. The attraction between the magnet and a piece of iron is subject to variation from the mere shape of the latter, there being a limit in the weight and shape of the iron, in which it will attract it more forcibly than any other; but this can only be determined by actual experiment.

V. It has already been observed, that magnetic attraction takes place only between the opposite poles of two magnets: however, it frequently happens, that though the north pole of one magnet be presented to the north pole of another, that they show neither attraction nor repulsion; but that when placed very near each other, they will attract. This is explained by our author in the following manner: "When a piece of iron, or any other substance that contains iron, is brought within a certain distance of a magnet, it becomes itself a magnet, having the poles, the attractive power, and, in short, every property of a real magnet. That part of it which is nearest to the magnet acquires a contrary polarity; but it often happens that one of the magnets, being more powerful than the other, will change the pole of that other magnet in the same manner as it gives magnetism to any other piece of iron which is exposed to its influence; and then an attraction will take place between two poles apparently of the same names; though, in fact, it is an attraction between poles of different names, because one of them has actually been changed. Thus, suppose that a powerful magnet has been placed with its north pole very near the north pole of a weak magnet, it will be found, that, instead of repelling, they will attract each other, because that part of the weak magnet which before was a north pole, has been changed into a south pole by the action of the strong magnet."

VI. Neither the attraction nor the repulsion of magnetism is sensibly affected by the interposition of bodies of any sort, excepting iron or ferruginous substances in general. Thus suppose, that, when a magnet is placed at an inch distance from a piece of iron, an ounce, or any determinate weight, is required to move it; the same will be required, though a plate of metal,

Degrees,
&c. of
Attraction.

metal, glass, or any other substance excepting iron be interposed. Neither the absence nor presence of air has any effect upon it.

VII. By heat, the power of a magnet is weakened; and when it arrives at that degree called a white heat, it is entirely destroyed. On the other hand, the attraction is increased considerably by adding more and more weight to the magnet: for thus it will be found that the magnet will keep suspended this day a little more weight than it did the day before; which additional weight being added to it on the following day, or some day after, it will be able to suspend a weight still greater, and so on as far as a certain limit. On the other hand, by an improper situation, or by diminishing the quantity of iron appended to it, the power will decrease very considerably.

VIII. The magnetic attraction is communicable to any given piece of steel only in a certain degree; and therefore if a magnet is strong enough to give the maximum of attraction to the piece, it cannot be afterwards rendered more powerful by applying another magnet, however strong. Thus, indeed, the steel may be made stronger for a few minutes; but this overplus of attraction begins to go off as soon as the strong magnet is withdrawn; and the power, continuing gradually to diminish, settles in a short time at that degree which is its limit ever after.

IX. Some have asserted, that in the northern parts of the world, the north pole of the magnet is stronger than the south pole, and that in the southern parts the contrary takes place; others are of a quite contrary opinion, affirming, that in the northern regions the south pole is stronger than the north one: but neither of these opinions have yet been sufficiently confirmed by experience.

X. If a piece of iron be held to one of the poles of a magnet, the attractive power of the other pole will thus be augmented: Hence we may understand why a magnet will lift a greater weight from a piece of iron than from wood or any other substance, viz. that the iron appended to the magnet becomes itself a magnet while it remains in that situation; and thus, having two poles, the iron which is placed near the one increases the attractive power of the other which adheres to the magnet, and enables it to sustain a greater weight than it would otherwise do.

XI. Soft iron acquires the magnetic power by being appended to a magnet; but it lasts only while the iron remains in that situation, vanishing as soon as the magnet and iron are separated from each other. With hard iron, but especially steel, the case is quite different; and the harder the iron or steel is, the more permanent is the magnetism which it acquires; though in proportion to this same hardness it is difficult to impregnate it with the virtue.

XII. The smallest natural magnets generally possess the greatest proportion of attractive power; so that there have frequently been seen magnets not weighing more than 20 or 30 grains, which would take up 40 or 50 times their own weight; but the greatest proportion of attractive power, perhaps ever known, belonged to the magnet worn by Sir Isaac Newton in his ring. It weighed only three grains, and was able to take up 746 grains, or nearly 250 times its own weight; and Mr Cavallo has seen one which could not weigh more

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than six or seven grains, and yet was capable of lifting 300. A semicircular steel magnet made by Mr Canton, weighing one ounce and 13 penny-weights, took up 90 ounces; but magnets of above two pounds seldom lift more than five or six times their own weight, or indeed seldom so much. It frequently happens, that a piece cut off from a large natural magnet will lift more than the stone itself did when whole; which is to be attributed to the heterogeneous nature of the stone itself; for if part of it be impure, it is plain that this can do nothing else than obstruct the virtue of the remainder, which consequently must act more powerfully when the obstruction is removed.

13. As the two magnetic poles taken together are capable of lifting a much greater weight than a single one, and as they are generally situated in opposite parts of its surface, it has been customary to adapt two broad pieces of soft iron to them, letting the pieces project on one side of the magnet; because, in that case, the pieces themselves being rendered magnetic, another piece of iron could be conveniently adapted to their projections so as to let both poles act in concert. These pieces of iron are generally held fast upon the magnet by means of a brass or silver box; in which case the magnet is said to be *armed*, and the pieces of iron are called its *armature*. For the same purpose, and to avoid the armature, artificial magnets have been commonly made in the shape of a horse-shoe, having their poles in the two extremities. This is by far the best shape for magnets; and the horse-shoe ones are always more powerful than straight magnetic bars.

§ 4. Of the Polarity of the Magnet.

Though, properly speaking, no magnet can have more than two poles, viz. a north and a south one, yet it frequently happens that both the natural and artificial kind are divided as it were into several magnets; each of which having likewise a north and south pole, the whole appears to have a number of poles, some of one denomination and some of the other.— This plurality of poles arises sometimes from the shape, but more commonly from the heterogeneous nature, of the magnet itself: and with respect to those which have more than two poles, the following laws have been observed: 1. That the parts adjacent to one pole are endowed with a contrary polarity. 2. That the poles of one denomination are not always equal in number, but that they never differ by more than one: thus if the magnet has four south poles, it will either have three, four, or five north poles. Good and properly shaped magnets, however, have only two poles directly opposite to one another; though in truth it is always one half, or at least a great part of the magnet, that possesses one kind of polarity, the other having the contrary kind; the two points, which we call the *poles*, being only those where the attractive virtue is strongest. Those two points, in good magnets, are joined by a line passing through the centre, which line is called the *axis* of the magnet; and a circle whose plane is perpendicular to the axis encompassing the middle of the magnet is called its *equator*; and to complete the supposed similarity between the terraqueous globe and magnetical bodies, the latter have frequently

Polarity
of the
Magnet.

MAGNETISM.

Plate CCLXXVI.

Fig. 1.

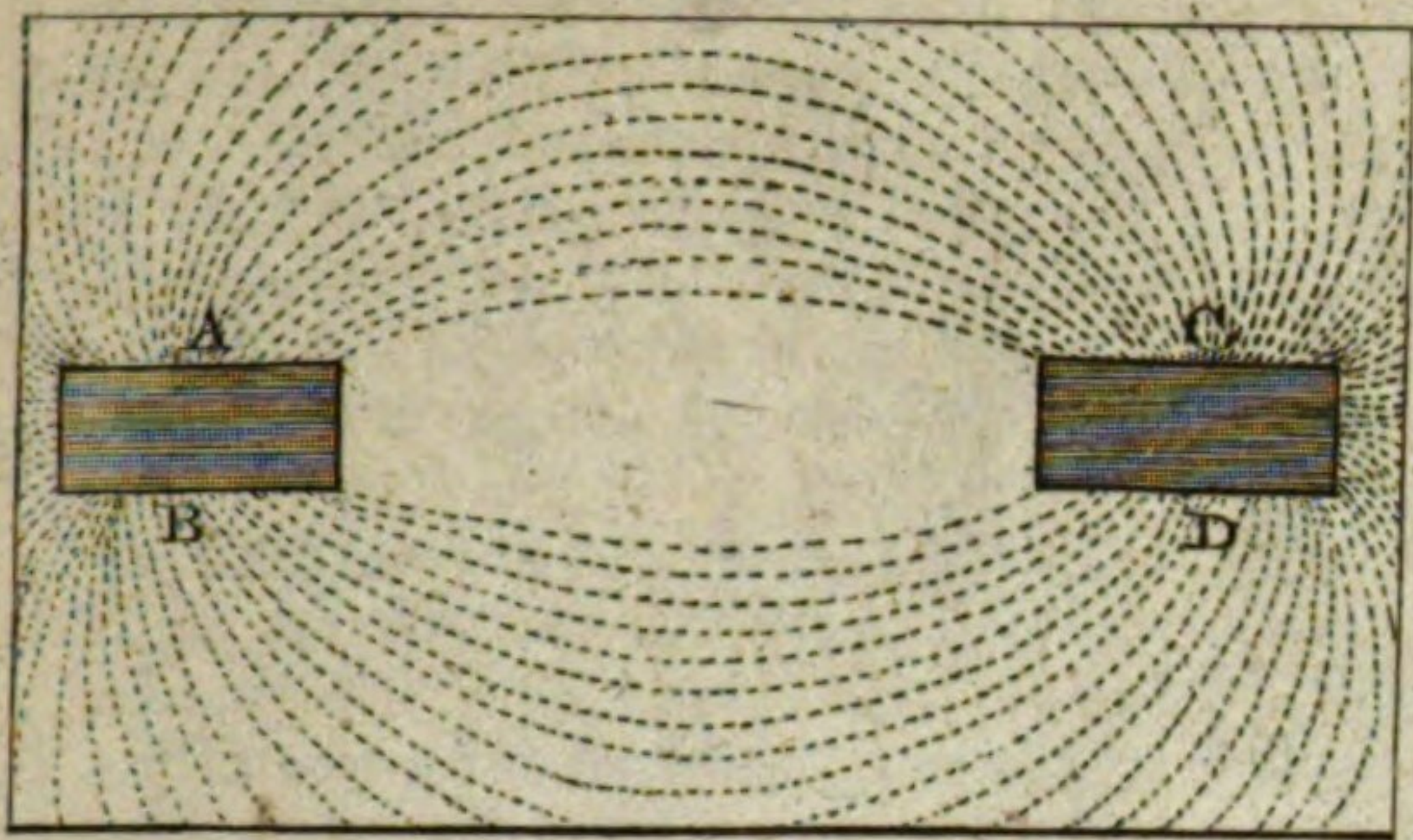


Fig. 2.

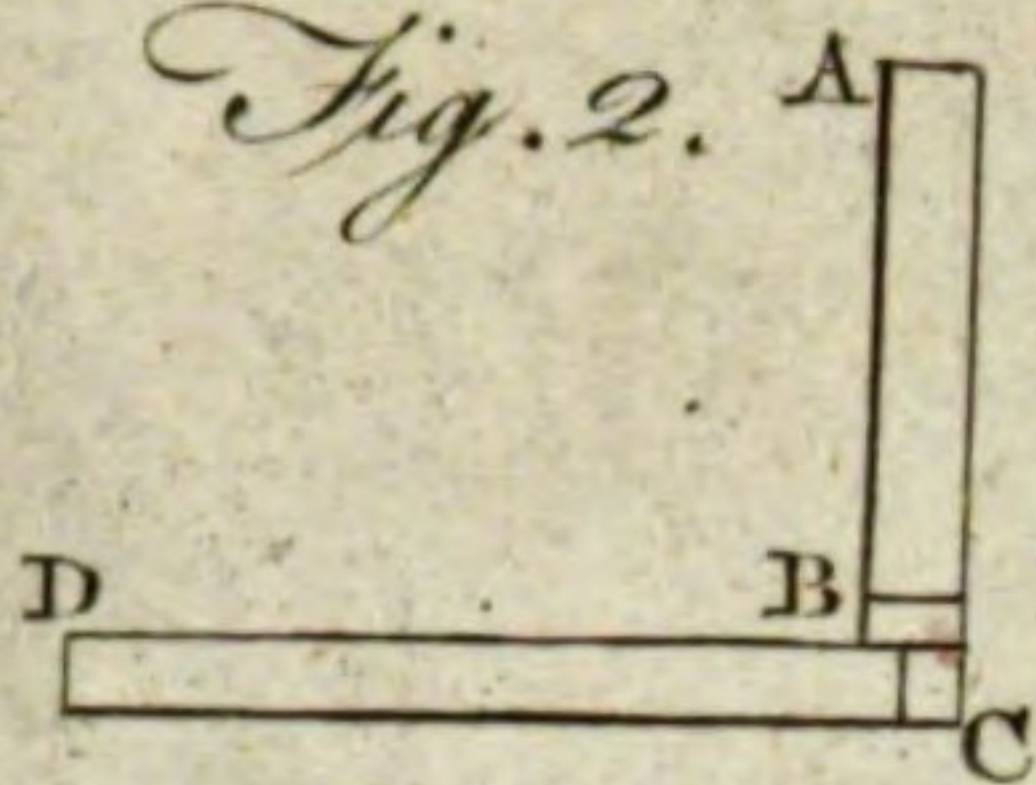


Fig. 3.

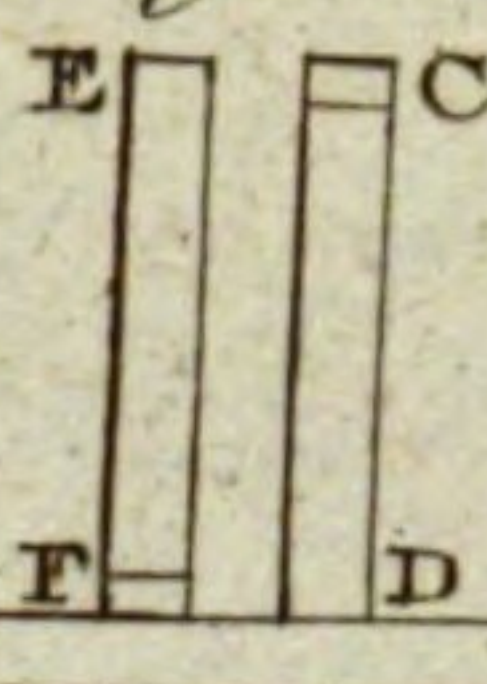


Fig. 8.



Fig. 4.

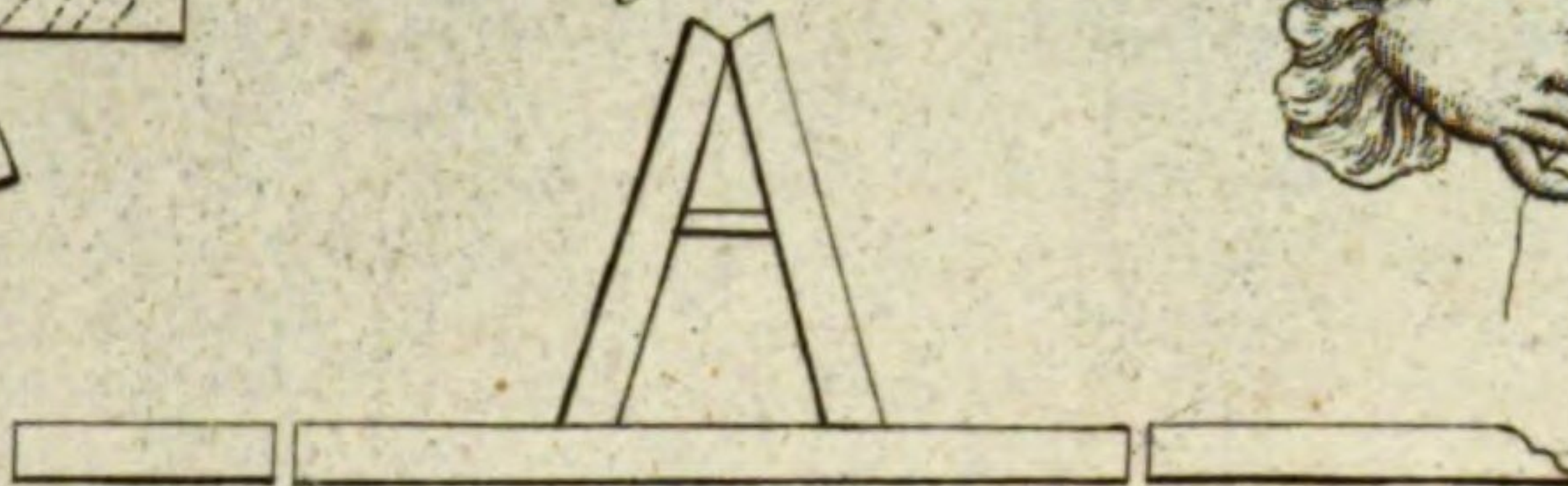


Fig. 5.

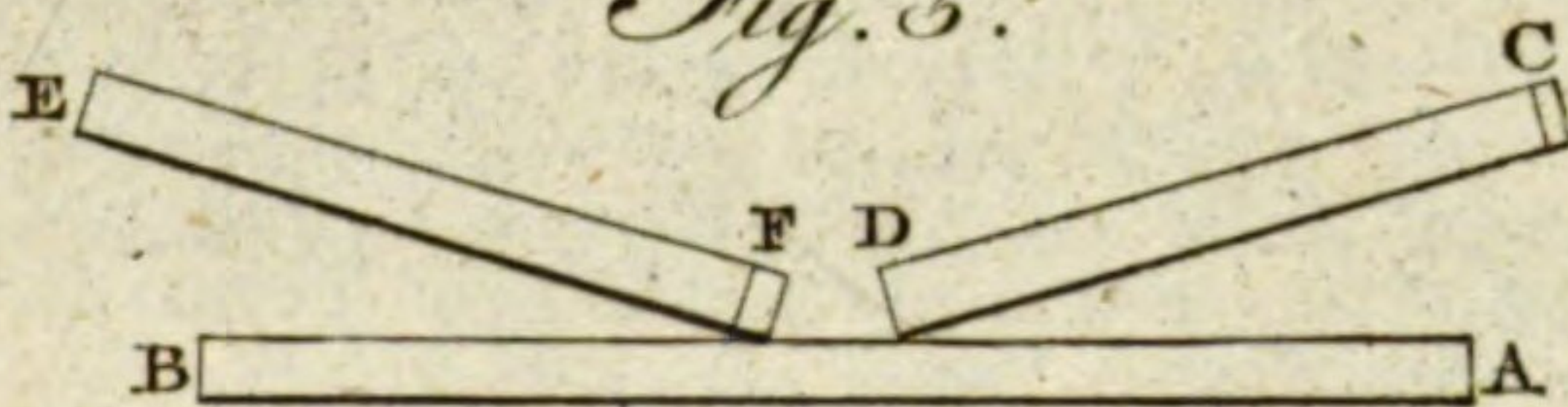


Fig. 7.

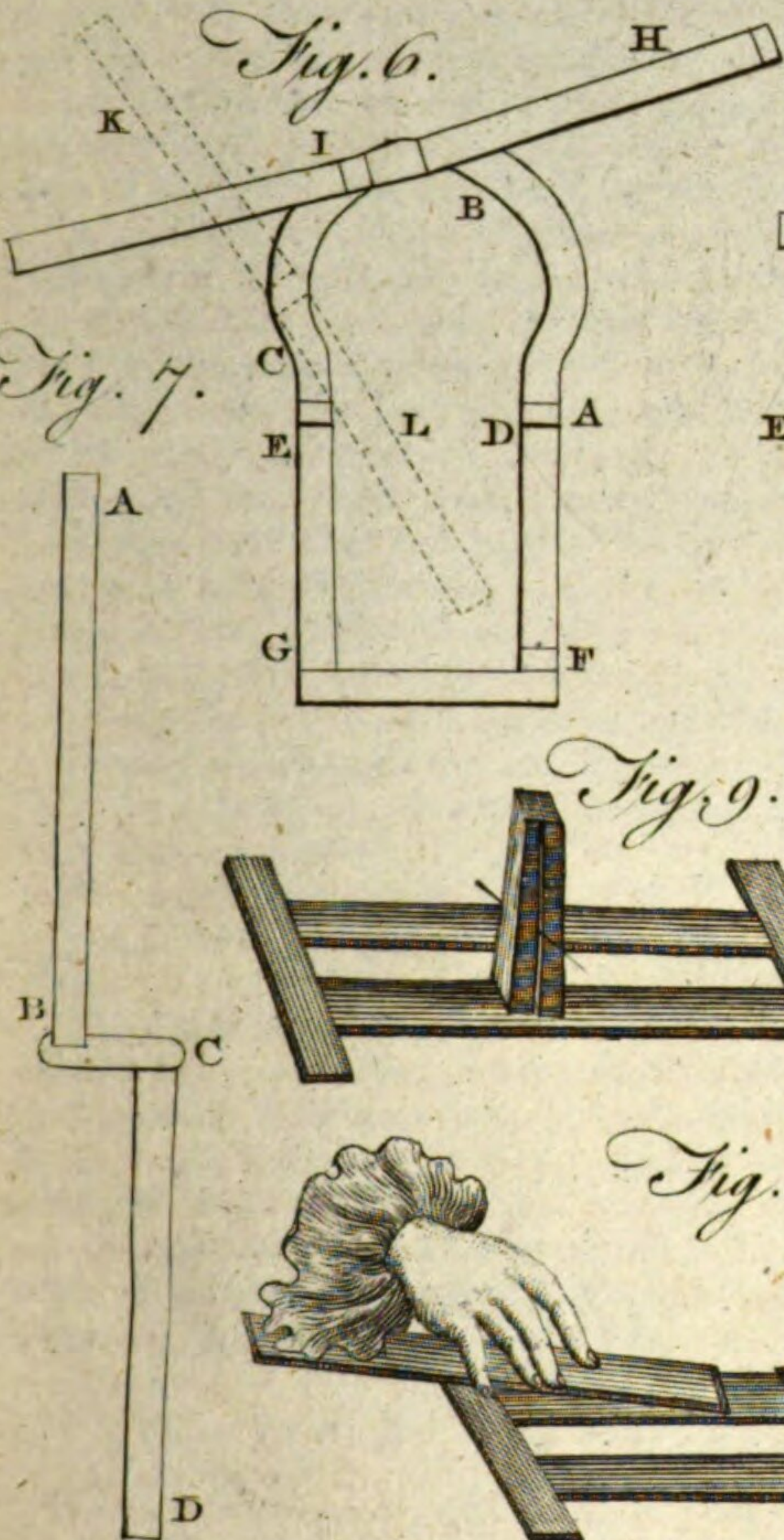


Fig. 9.

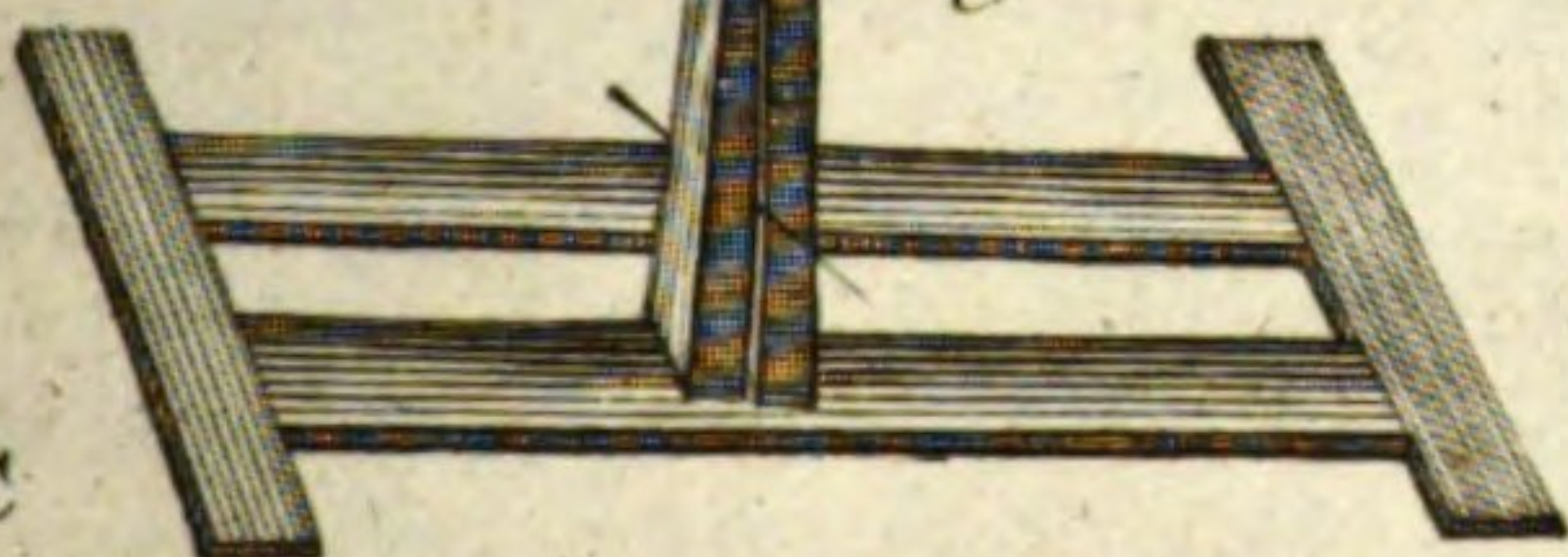


Fig. 13.



Fig. 10.

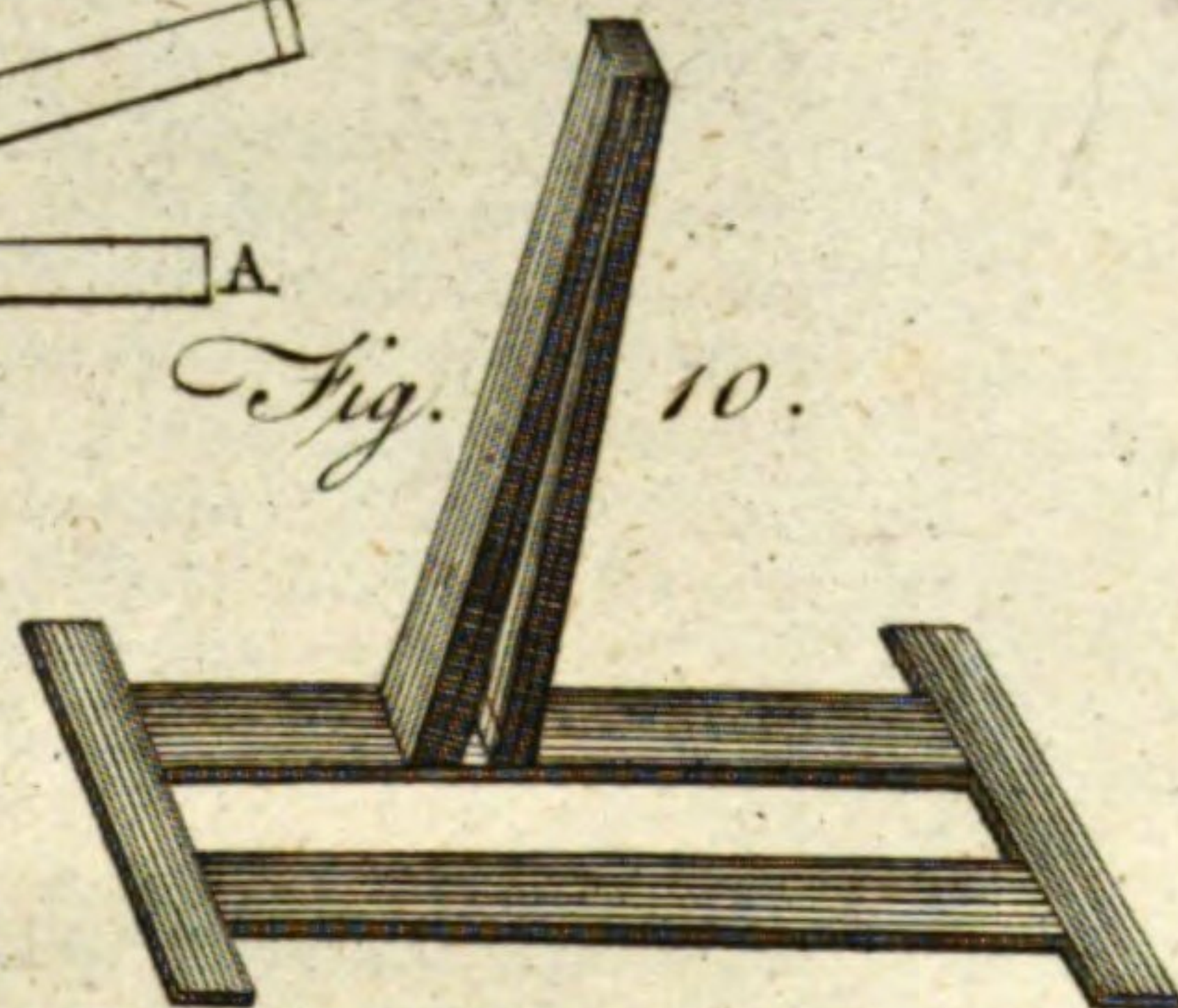


Fig. 12.



Fig. 11.

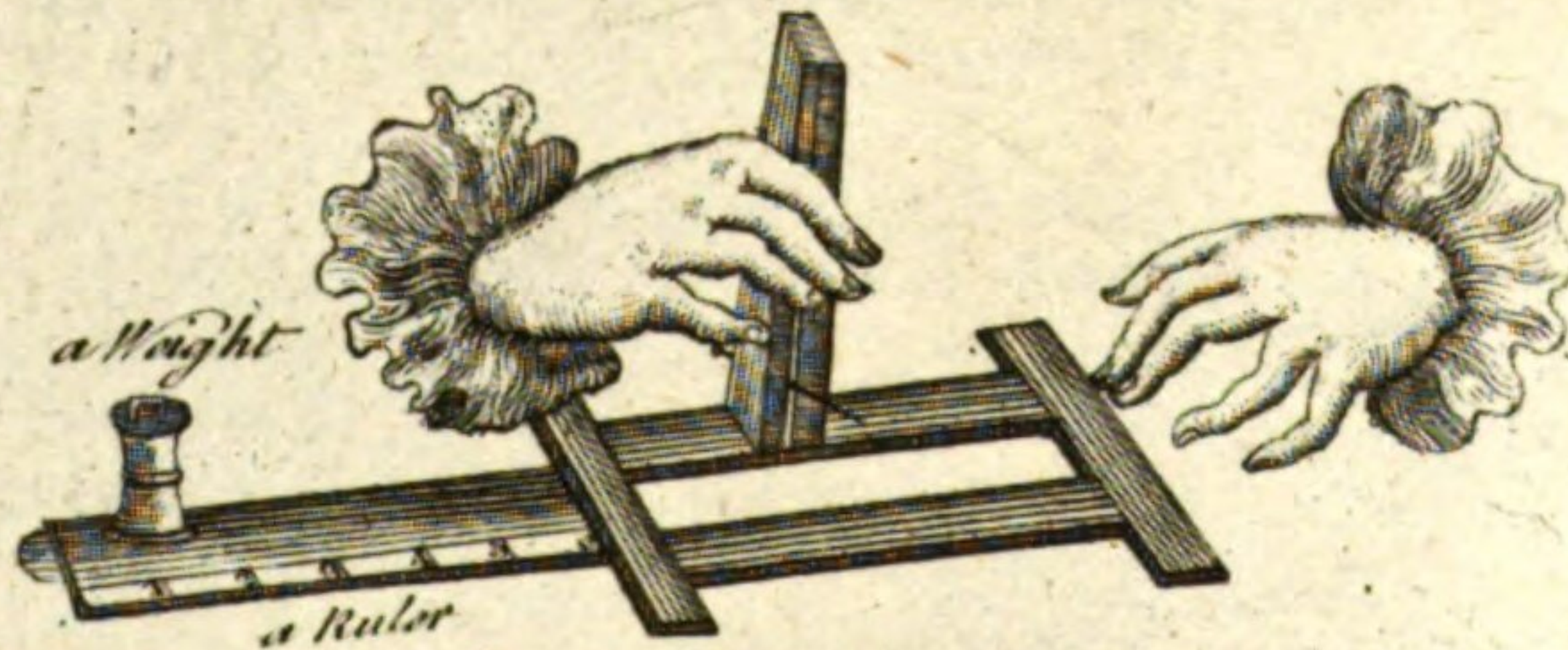


Fig. 14.

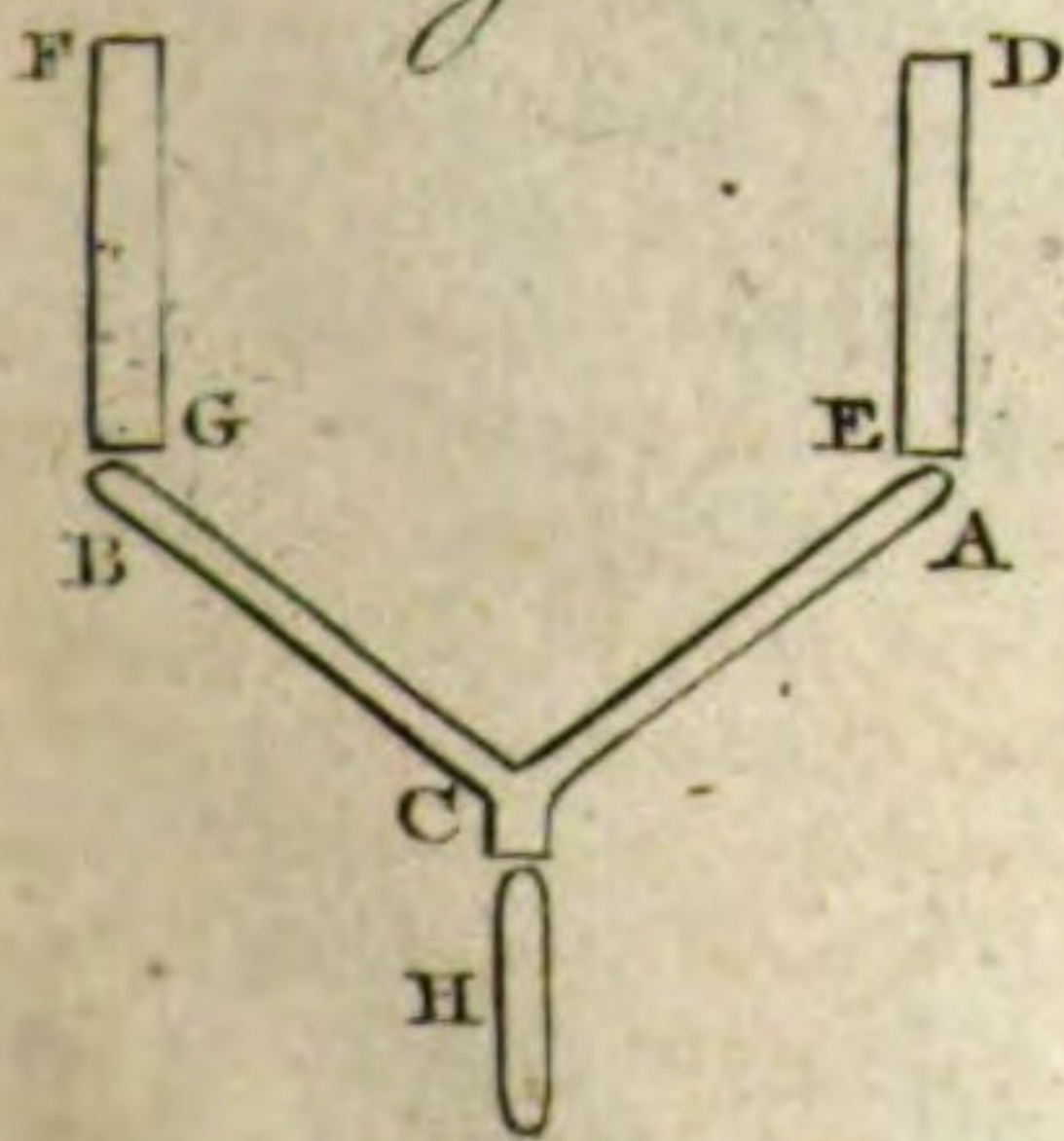


Fig. 16.

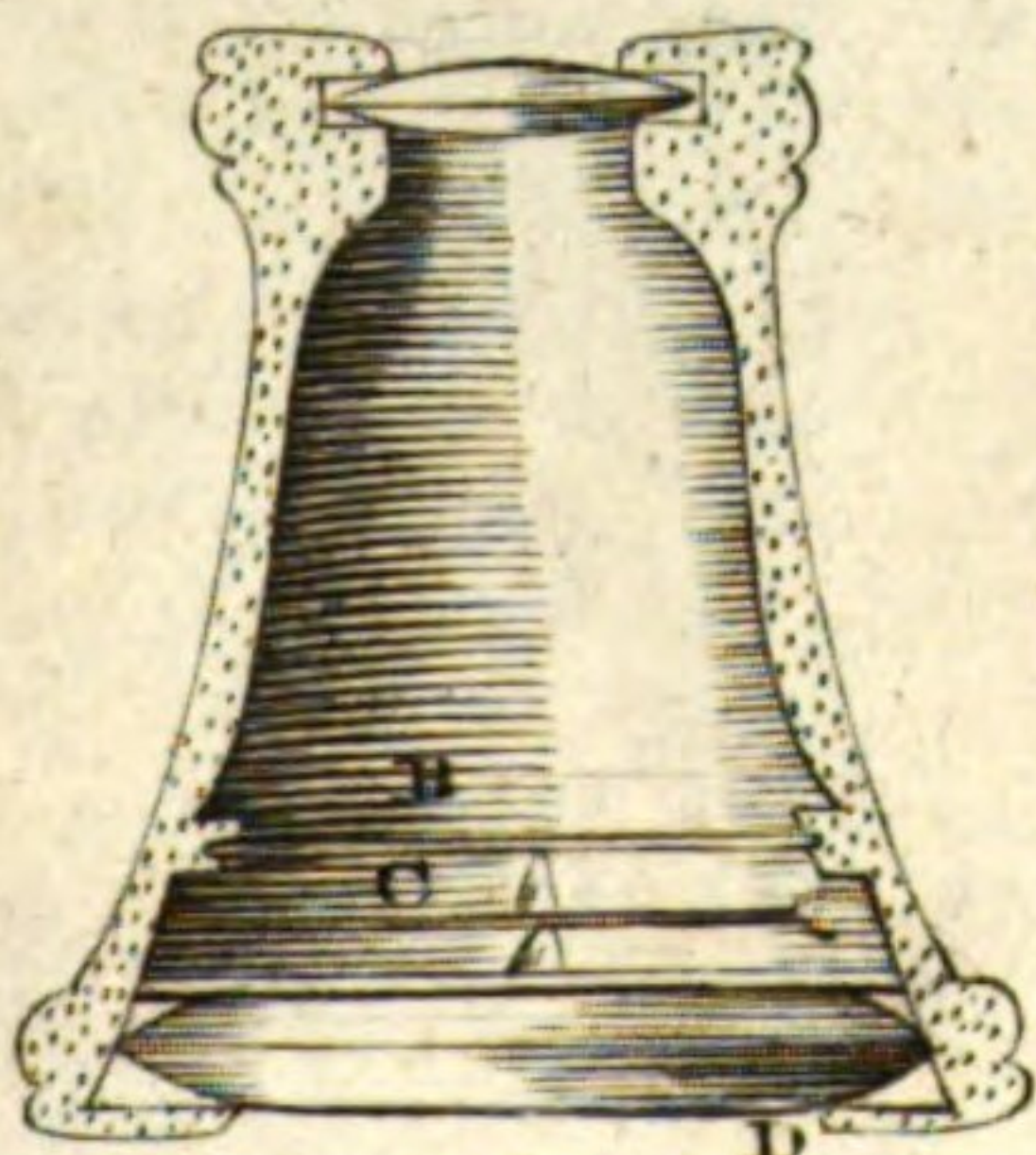
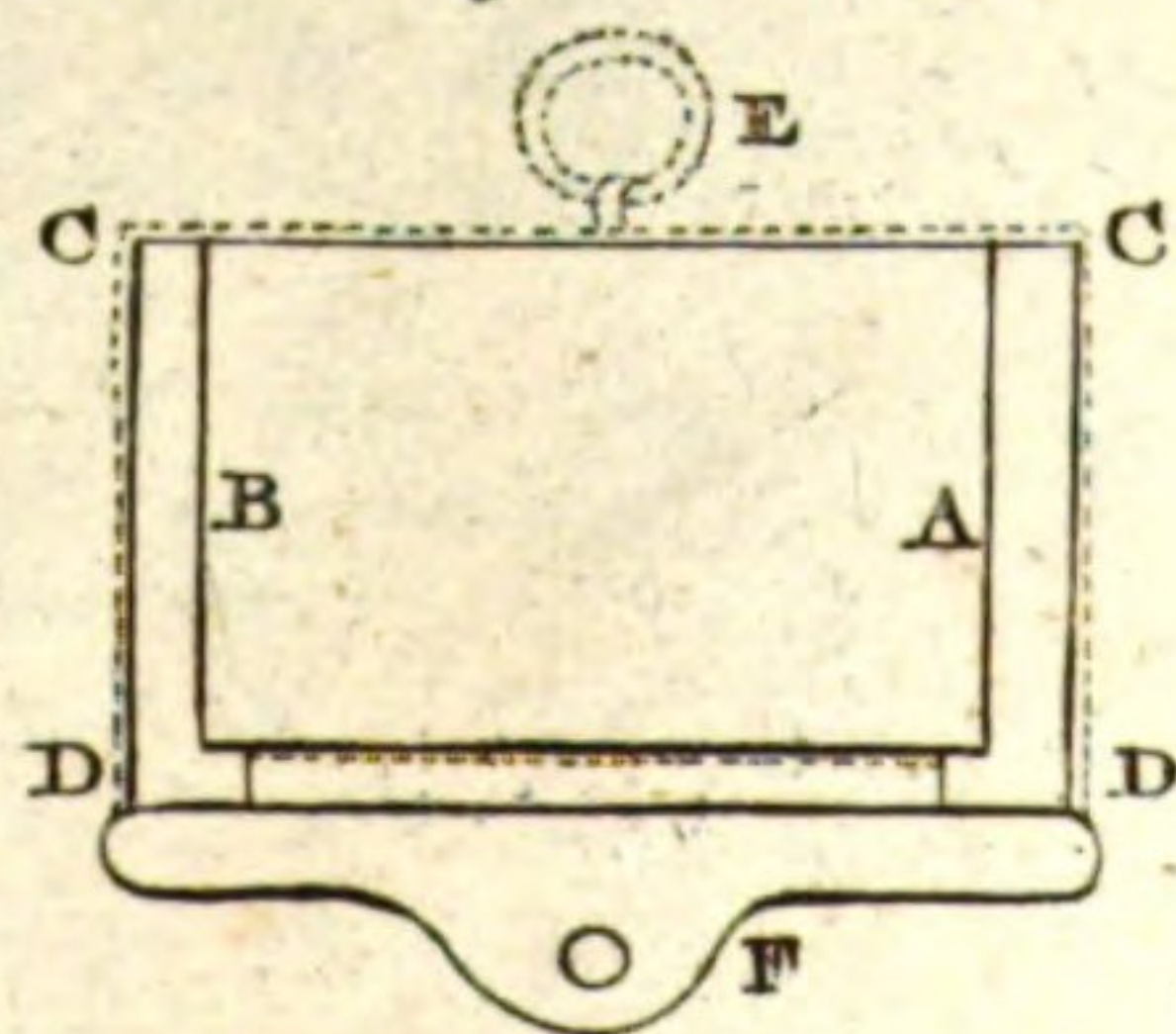


Fig. 15.



A. Bell Prim Wal Sculptor fecit

Theory quently been formed of a spherical shape, with the poles and equator marked upon their surface; in which case they have got the name of *terrellas* or small earths. On breaking a magnet into two or three parts, each one becomes a perfect magnet, though they have not always an equal number of poles of the same denomination. The poles of the broken pieces generally answer to those of the whole magnet which were nearest them, though this does not always hold good.

A magnet with two poles will very readily place itself in the magnetic meridian, if suspended by a fine thread, or otherwise left at liberty to turn; but when there are more than two poles, it may happen that their opposite tendencies will counteract each other in such a manner that the magnet cannot traverse; though it will still attract and repel as though it had only two. Thus, suppose that an oblong magnet has a north polarity at both ends and a south polarity in the middle; if the north poles are both equally strong, then it is plain, that neither of them can point towards that quarter in preference to the other; but if a magnet of this kind be broken in the middle, the two parts will traverse very readily. It very seldom happens, however, that both poles are equally strong; in which case one of them will always get the better of the other, and the magnet will traverse notwithstanding its having more than two poles. The polarity of the magnet is its most valuable property, as upon it depends the construction of the magnetic needle or mariner's compass so useful in navigation; for an account of which, see the article *COMPASS*, and *NEEDLE*.

For the variation of the needle, or its declination from the true north and south direction, see the article *VARIATION*.

An account of the inclination or dipping of the magnetic needle is given under the article *DIPPING Needle*.

The directive, or polar power of a magnet, extends farther than its attractive power: thus if a magnet, freely suspended, be placed in the neighbourhood of another, it will be found that they can affect each other's direction when their attraction towards iron or towards each other cannot be perceived. This may be easily tried by placing one of them in a scale of a balance and the other at a distance below it.

CHAP. II. *Theory of Magnetism.*

The phenomena of magnetism, like those of electricity, depend on a cause so little subject to the investigation of our senses, that any regular and well supported theory can as yet scarcely be expected. The subject indeed is still more difficult than that of electricity; for in the latter the fluid is often made visible and otherwise perceptible by our senses; but no experiment could ever render the cause of magnetism perceptible otherwise than by its effects. The idea of its being occasioned by a fluid entering in at one pole and passing out at another, took its rise, and became pretty general, from the following experiment: Having put a small artificial magnet among some iron-filings laid upon a piece of paper, give the table a few gentle knocks with your hand, so as to shake the filings a little, and they will dispose of themselves as represented in fig. 1.

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where A B and C D represent the two poles of the magnet, and the dotted lines the disposition of the filings. But Mr Cavallo observes, that this experiment cannot be any proof of the fluid's circulation; "because if the fluid, of whatever nature it may be, did really circulate from one pole to the other, and had any action on the filings, these would be all driven towards that pole to which the fluid directed its course. The true cause of the disposition of the filings is their becoming actually magnetic, and their two extremities being possessed of contrary polarities. Now, when there are many particles of iron near the magnet, those which touch its surface are rendered magnetic; consequently they attract other particles, and these being also rendered magnetic, attract others, and so on, forming strings of small magnets, which gradually increase in power as they recede from the magnet. As each of these particles has two magnetic poles, by a little consideration it will appear, that the farthest ends of these strings or lines which proceed from the parts adjacent to one of the poles of the magnet, for instance the north, are likewise possessed of the north polarity; and the farthest extremities of those which proceed from the parts adjacent to the south pole of the magnet, are possessed of the south polarity: hence, when they come sufficiently near, they attract the extremities of the former strings, and consequently form the curves delineated on the figure. The shaking of the table in this experiment serves to stir the filings, by making them jump up a little way, and thus place themselves in the proper situation; otherwise the action of the magnet will not have power sufficient to dispose properly those particles which stand at a considerable distance."

The late discoveries in electricity have naturally suggested another theory, viz. that the magnetic phenomena may be occasioned by a fluid analogous to the electric, or perhaps by the very same: and with a view to investigate this theory, the phenomena of magnetism and electricity have been accurately compared with each other, and the analogy between them carefully marked. This analogy is found to consist principally in the following particulars:

1. Electricity is of two kinds, positive and negative, each of which repels its own kind, and attracts the opposite. In magnetism, the north and south poles do the same; each being repulsive of its own kind of magnetism, and attracting the opposite.

2. In electricity, whenever a body in its natural state is brought near an electrified one, it becomes itself electrified, and possessed of the contrary electricity; after which an attraction takes place. In like manner, when a piece of iron or steel is brought within the influence of a magnet, it becomes itself possessed of a magnetism contrary to that which the magnet possesses, and is of course attracted.

3. One sort of electricity cannot be produced without the other, neither is it possible to produce one kind of magnetism without the other also.

4. The electric power may be retained by certain substances, as amber, glass, &c. but easily pervades other substances, which are therefore called *conductors*. Magnetism has a similar conductor in soft iron; for by means of it the virtue may be extended farther

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than can be done without it; at the same time that the iron itself loses all magnetic power the moment it is separated from the magnet. Hardened iron, cast-iron, and steel, perform a part analogous to that of electrics; for the virtue does not easily pervade them, but is retained, and may be communicated by them to other unmagnetic pieces, in like manner as the electric virtue may be communicated to bodies by means of an excited electric. With regard to other substances, they seem not to be properly conductors of magnetism, because the fluid pervades them as though nothing were present, and they cannot transmit the virtue farther than it would go without them. With soft iron it is otherwise. Thus, if to one of the poles of a magnet we append a piece of iron of considerable length, the end farthest from the magnet will likewise attract iron with much more force than the magnet could do at that distance without it, while at the same time this attractive power is plainly that of the magnet itself, and not any way inherent in the iron, as it vanishes the moment we separate them. If a piece of hard steel of an equal length with the iron be appended to the magnet by one of its ends, we will find that the distant end will not manifest any attraction, and it will be a considerable time before the magnetic virtue can diffuse itself for any distance along it; but when the separation is made, the steel will be found to be magnetic, and will preserve its virtue for a long time.

5. The electric virtue exerts itself most powerfully on points, which are found to carry it off or receive it in vast quantities. In like manner a magnet will hold a piece of iron more powerfully by a corner, or blunt point, than by a flat surface. On sharp points indeed the magnet has but little hold by reason of the deficiency of surface.

6. From some experiments related under the article *ELECTRICITY*, it appears possible to superinduce the negative and positive electricities upon one another; and in magnetism it is possible to do the same. Thus, if we place a wire of some length upon a pivot, so that it can turn very easily, by touching both ends of it upon the poles of a magnet it will acquire a polarity; one end being repelled by one pole and attracted by the other. If now we give the north end, for instance, a very slight touch with the north pole of the magnet, we will find that it has a small degree of south magnetism superinduced upon it, so that on approaching the south pole of the magnet it will be repelled; but by approaching the magnet nearer, or holding the wire for a little from flying away, the south magnetism of the wire will be entirely destroyed, and the north magnetism appear as before. This experiment is not very easily made; its success depends on having the first magnetism as strong and the second as weak as possible.

These are the most remarkable particulars in which magnetism and electricity are found to agree; but the differences between them are no less remarkable than those particulars. The magnetic power affects none of our senses, and most perceptibly at least attracts only iron; while electricity attracts and repels bodies of every kind indiscriminately. The electric virtue resides on the surface, but that of the magnet pervades the whole substance. A magnet loses nothing of its power by communicating its virtue to other bodies,

but electricity always does: and, lastly, the magnetic virtue is permanent; whereas that of electricity, without the greatest care, is exceedingly perishable, and capable of being dissipated.

Notwithstanding these disagreements, however, the analogies betwixt magnetism and electricity are so great, that the hypothesis of a magnetic as well as of an electric fluid has now gained general credit; and upon this hypothesis Professor *Æpinus* has attempted to solve the phenomena of magnetism in the following manner:

1. This fluid is sufficiently subtle to penetrate the substance of all terrestrial bodies, and like the electric fluid is supposed to be repulsive of itself.

2. There is a mutual attraction between the magnetic fluid and iron, but an indifference betwixt it and all other bodies.

3. There is a great resemblance betwixt ferruginous bodies and electrics, as the magnetic fluid passes with difficulty through the former.

4. Iron and all ferruginous substances contain a quantity of magnetic fluid equably dispersed through their substance when those bodies are not magnetic. In this state they show neither attraction nor repulsion, because the repulsion between the particles of magnetic fluid is balanced by the attraction between the matter of those bodies and the fluid; in which case these bodies are said to be in a natural state: but when in a ferruginous body the quantity of magnetic fluid is driven to one, then the body becomes magnetic; one extremity of it being now overcharged with magnetic fluid and the other undercharged. Bodies thus constituted, viz. rendered magnetic, exert a repulsion between their overcharged extremities in virtue of the repulsion between the particles of that excess of magnetic fluid, which is more than overbalanced by the attraction of their matter. There is an attraction exerted between the overcharged extremity of one magnetic body and the undercharged extremity of the other, on account of the attraction between that fluid and the matter of the body: but to explain the repulsion which takes place betwixt their undercharged extremities, we must either imagine that iron when deprived of the magnetic fluid is repulsive of itself, or that the undercharged extremities appear to repel each other only because either of them attracts the opposite overcharged extremities.

A ferruginous body, therefore, according to this hypothesis, is rendered magnetic by having the equable diffusion of magnetic fluid through its substance disturbed, so as to have an overplus of it in one or more parts and a deficiency in others, its magnetism remaining as long as its impermeability prevents the restoration of the balance between the overcharged and undercharged parts. A piece of iron is rendered magnetic by the vicinity of a magnet; because when the overcharged part or pole of the magnet is presented to it, the overplus of the magnetic fluid in that pole repels the fluid away from the nearest extremity of the iron; which therefore becomes undercharged, or possessed of the contrary polarity, to the most remote part of the iron, which consequently becomes overcharged, or possessed of the same polarity as the presented pole of the magnet. When the piece of iron is rendered magnetic by presenting it to the undercharged extremity or pole of the magnet, then the

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part of the iron which is nearest to it becomes overcharged, &c. because that part of the magnet, being deprived of its magnetic fluid, attracts the magnetic fluid of the iron to that extremity of the iron which lies nearest to itself.

Hence, in order to give magnetism to a piece of steel, the strength of the magnet employed must be such as to overcome the resistance which the substance of the steel makes against the free passage of the magnetic fluid: hence a piece of soft steel is rendered magnetic more easily than a hard one, and a strong magnet will render magnetic such bodies as a weak one cannot affect. When two magnets of equal power have their opposite poles presented to each other, they mutually preserve and strengthen the powers of each other; but when poles of the same denomination are forced together, if the powers are equal, they mutually weaken each other; or if unequal, the weaker will have its poles altered, or perhaps its attractive power entirely destroyed in a short time.

Before we make any remarks upon this hypothesis, it will be necessary to take notice of another, which Mr Cavallo considers as so well established, "that there can hardly be a philosopher sceptical enough to doubt of its truth." This is, that the earth itself is a magnet; which position, he says, is proved almost to a demonstration in the following manner.

1. Almost all the phenomena which may be exhibited with a common magnet may also be exhibited with the earth, as far as it can be tried. And,

2. Vast masses of iron or ferruginous matter actually magnetic are dug out of the earth almost in every part of it.

In support of the above position, he adduces the phenomena of the compass, dipping-needle, and the magnetism (to be afterwards explained) which soft iron receives when properly situated. All these may be imitated by a common magnet or terrella. An objection, however, occurs, that the most remarkable phenomenon of all, viz. the attraction of iron, is wanting. No experiment has yet shown that this metal is attracted more powerfully near the poles than at the equator itself; yet this ought very notably to be the case in such a large magnetic body. Our author indeed is of opinion, that if the experiment were tried with sufficient accuracy, the weight of the iron would be augmented by proceeding a considerable way either southward or northward. But besides that this hypothesis is as yet entirely unsupported by experiment, the difference he even supposes is quite trifling and insignificant. The dipping of the needle may indeed show that in this hemisphere there is a superiority of attraction between one end of the needle and the earth: but it remains to be proved whether this superiority resides in the needle or in the earth itself. The following consideration indeed seems evidently to show that the power, whatever it is, resides in the needle itself; namely, that at the equator, the needle ought to remain in an east and west direction, if so placed; because of the equal attraction of the north and south poles. Were the needle carried to the pole itself, we can only suppose that it would point perpendicularly downwards; in every other case, the attraction will not be perpendicular, but oblique: and supposing us to recede from the point of perpendicular attraction only a few miles,

the obliquity would become so great, that no attraction or repulsion towards that point would be distinguishable from an horizontal direction. The inclination of the needle therefore shows, that it is not actuated by the influence of a distant point in the earth; but by some power in the atmosphere immediately acting upon the needle, and directing its course either to the earth, or from it, in a certain position.

Those who maintain the magnetism of the earth, have been considerably embarrassed with some of the natural phenomena. The variation of the compass first showed that the needle was not influenced by those points on which the earth turns round in its diurnal course: but this was easily solved by another hypothesis, viz. that the earth had two magnetical poles by which the needle is influenced, and two others round which it turns on its axis. This hypothesis was likewise embarrassed by the continual shifting of the variation either to the eastward or westward. Hence another supposition was made by Dr Halley; namely, that there is a large magnet inclosed within the body of the earth, which not being fixed to the external part, moved with respect to it, and of consequence occasioned the variation. This was likewise overthrown, by observing that the variation of the compass was irregular, and differed so much in different parts of the world, that it could not be owing to any regular cause diffused over the whole. Four magnetic poles were then supposed to lie within the earth, and to be moveable with respect to each other; and that therefore the variation, whose theory would now be very intricate, ought to be derived from all their actions conjointly: but, notwithstanding all this complication of poles, it might still be objected, that some kind of regularity, not observed in the variation of the magnetic compass, ought to have taken place. So that as yet there is no theory which seems to explain the variation with any kind of certainty.

The different hypotheses on this subject are more fully considered under the article VARIATION: here we shall only observe, that with respect to the magnetism of the earth, the particulars already related seem to decide against its existence. The most unequivocal proof we have of the existence of magnetism is the attraction of iron; and this capital mark is deficient, or at least has never been improved, in the earth. The poles of all the magnets, we know, are fixed and invariable; nor are we obliged to have recourse to magnets within magnets, or other uncouth suppositions, to account for their phenomena: if the earth is a magnet, therefore, the magnetism it possesses must be of a kind so different from the property usually distinguished by that name, that we can in no respect determine them to be the same.

Mr Cavallo is of opinion that "the magnetism of the earth arises from the magnetism of all the magnetic substances contained in it, and intermixed with other bodies; that the magnetic poles of the earth may be considered as the centres of the polarities of all the particular aggregates of the magnetic substances; and that those principal poles must change place relatively to the surface of the earth, according as the particular aggregates of magnetic substances within the earth are in some manner or other altered, so as to have their power diminished, increased, ap-

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Theory.

proached, or removed from the principal poles." But this seems not by any means sufficient to account for the phenomena. The magnetic needle is indeed affected by iron at a distance, but that distance is by no means considerable. A magnet or needle in a house in one street will not be affected by a smith's shop or iron warehouse in another; and there is an undoubted certainty that the magnetic needle is affected on some parts of the sea where no magnetic bodies can be present unless at a great distance on land, or below the unfathomable depths of the ocean. Besides, let us imagine as many of these bodies as we please within the surface of the earth, they must be supposed, in order to account for the phenomena of the needle, to have their poles lying all nearly the same way; which can by no means be proved to be the case: not to mention that the attraction of iron would in some places be very perceptible, which has never yet been experienced in any part of the world.

Lastly, the hypothesis of the magnetism of the earth seems to be entirely overthrown by the following curious method of giving magnetism instantaneously to an iron-bar. Take a bar of soft iron two or three feet long, and between an half and two inches thick; which description is very well answered by some kitchen poker. Place it in the magnetical line, *i. e.* the posture assumed by the dipping needle; or if a needle of this kind is not at hand, place it straight up in any degree of north or south latitude beyond 40°, or horizontally if nearer to the equator. Present then a magnetic needle to various parts of the bar; and it will be found, that in this country the lower half of the bar will repel the north end of the needle, and the upper half attract it. In south latitudes the case will be reversed; for the lower end will attract the north pole of the needle, and the upper end repel it. If the bar be not very short, its extremities will also attract small bits of iron, as filings, &c. On turning it upside down, the end which repelled the north pole of the needle before will now attract it; the reason of which is, that in the northern hemisphere the end which is nearest the earth always becomes a north pole, and in the southern hemisphere a south one. Now it is plain, that considering the distance of both poles of the earth from the iron-rod, any kind of posture in which we can place it must make a difference so trifling, that we cannot suppose the one to influence it more than the other. The whole phenomenon shows that there is in the atmosphere a current of fluid either going into the earth, or coming out from it, which influences iron when held in the direction in which itself moves. That it does not influence the metal when lying horizontally, may be owing to its want of sufficient breadth to render the effect perceptible. The earth therefore is not a magnet, but is surrounded by a fluid whose motion is productive of magnetism in iron; and most probably, though it produces this as it were accidentally, will be found to answer much more important purposes in the economy of nature. The next question then is with regard to the fluid itself: and this, from many articles in this work, will appear to be the same with that of electricity. Under the article *AURORA Borealis*, *EARTHQUAKE*, *ELECTRICITY*, &c. it is shown, that the solar light, absorbed by the equatorial regions of the earth, becomes subject to

Practice.

new laws of motion, acting in short as if it were another fluid, in which state we call it *electricity*, or the *electric fluid*. In this state it passes through the substance of the earth from the equator towards the polar regions, getting out again in the vicinity of the poles, ascending into the high atmospheric regions, and then returning to the equatorial parts from whence it came. On this supposition, which appears to be greatly confirmed by various natural phenomena, it is easy to see, why in the northern and southern parts the direction of the currents issuing from the earth should always become more and more perpendicular to the earth as we approach the poles, and on the contrary why their direction must be horizontal or nearly so in the equatorial parts. The discovery of this general cause therefore seems to be the nearest approach we can as yet make to the knowledge of the origin of magnetical phenomena. In what manner iron more than other metals is influenced by this fluid, or why the direction of a current of electric matter either to or from the earth, should cause such strong attractions as magnetical bodies are sometimes endowed with, we have as yet no data for understanding.

Æpinus's theory of an accumulation of the electric fluid in one pole, and a deficiency of it in the other, seems not to be feasible in any respect. It is impossible to show why the mere turning of a bar upside down should accumulate the fluid, unless it was a gravitating one in the end next the earth; and though we should even make this extravagant supposition, it will be as difficult to account for the very same fluid being repelled by the earth in the southern hemisphere: for if we account the north magnetism an accumulation, we must count the south one a deficiency; or if the south magnetism is an accumulation, the opposite one must be a deficiency; and whichever supposition we adhere to, the difficulties are equally great and unfurmountable.

CHAP. III. Practice of Magnetism.

THIS consists in communicating the magnetic virtue from one body to another; making artificial magnets, compasses, dipping-needles, &c.; and investigating the various phenomena resulting from bodies placed in different situations.

§ 1. To communicate Magnetism by the Loadstone.

Magnetism is communicated merely by presenting a piece of iron or steel to one of the poles of a magnet or loadstone, even without touching it; though a strong and permanent power cannot be given without contact, or even stroaking the one upon the other for a number of times. In this operation, that part of the ferruginous body which touches the pole of the magnet acquires the contrary magnetism; that is, if it touches the north pole, it will turn towards the south, *et vice versa*. The power acquired is strongest when soft iron is applied, weaker with hardened iron, and weakest of all with hard steel: but the permanency of it follows just the reverse of this rule; for steel or hardened iron will preserve its virtue for many years, but soft iron loses it the moment we withdraw the magnet. When we desire a strong and permanent virtue, therefore, it is best to use the hardest steel, and to impregnate it by means of one or more pow-

Practice. erful magnets; taking care that the north pole of the magnet which gives the virtue be applied to that end of the steel which is to be made the south pole. The same method may be employed in rendering a weak magnet more powerful than before, or in restoring the virtue to one which has lost it.

The operation of communicating magnetism to pieces of steel or iron, is called *touching* them; and as this is of the utmost utility in navigation, for the purpose of giving polarity to needles, very considerable pains have been bestowed upon the subject, in order to discover the methods of giving them the magnetic virtue in the most effectual and permanent manner.—

Plate CCLXXVI When only one magnetic bar is to be made use of, one of its poles must be applied as represented fig. 2. where C D represents the needle or steel bar to be impregnated. The magnet A B is then to be drawn all along the surface of it, till it reaches the extremity D. The magnet being then removed, must be applied to the extremity C, and drawn over the needle as before. Thus the needle must be rubbed several times; by which means it will acquire a considerable degree of magnetism. In this method, that other extremity of the needle which the magnet touched last acquires the contrary magnetism; that is, if B be the north pole of the magnet, C will be the north pole, and D the south of the needle. This method, however, is never found to be equally effectual with that in which two magnets, or both poles of one magnet, are made use of.

To communicate magnetism by means of two magnetic bars, place the bar or needle A B, fig. 3. upon a table; then set the two magnetic bars C D, E F, straight upright upon it at a little distance, equal on both sides from the middle of the bar A B, and in such a manner that the south pole D of one of the bars may be nearest to that end of the bar A B which is to become the north pole, &c. These two bars must then be slid gradually towards one extremity of the bar, keeping them constantly at the same distance from each other; and when one of them, for instance C D, is arrived at A, then they must be slid the contrary way, till E F arrives at B; and thus the bar A B must be rubbed a greater or smaller number of times, till it will be found by trial to have acquired a considerable power. When the magnetic bars are powerful, and the bar A B of very good steel, and not very large, a dozen of strokes are fully sufficient; but when the bars are to be removed from the bar A B, care must be taken to bring them to the same situation where they were first placed; viz. at a little and equal distance from the middle of the bar A B, from whence they may be lifted up.

If it be required to communicate the greatest magnetic power possible, we may proceed in the following manner: 1. The magnetic bars may be joined at top, as in fig. 4. interposing a piece of wood, or any other substance excepting iron; for thus the opposite poles being contiguous in the upper part, strengthen each other, and of consequence the lower ones are also strengthened. 2. The bar to be rendered magnetic may be placed between the bars of soft iron, as shown in the same figure. 3. The magnetic bars may be inclined the contrary way, as recommended by Mr Æpinus, making an angle of about 15 degrees with the

bar A B. See fig. 5. In the same manner may a bar be rendered magnetic by an armed or horse-shoe magnet. In any of the methods hitherto mentioned, however, the bar to be rendered magnetic must be stroked on every side; and to let the magnetic centre fall just in its middle, care must be taken to stroke one half of the bar just as much as the other. Whenever a steel bar, or, in general, any piece of ferruginous matter, is rendered magnetic by the application of two bars, or by the two poles of one magnet, the operation is called the *double touch*, but the single touch when only one bar is applied.

Artificial magnets of a semicircular form, or shaped like a horse-shoe, have the magnetism communicated to them in the same manner with those which are straight, only the magnetic bars used for this purpose must follow the curvature of the bar to be impregnated. Thus, suppose it is required to impregnate the crooked piece of steel A B C, fig. 6. lay it flat on a table, and to its extremities apply the magnets D F, E G, joining their extremities F G with the conductor or piece of soft iron F G. Apply then the magnetic bars H I to the middle of the piece A B C, and stroke it with them from end to end, following the direction of the bent steel, so that on one side of it the magnetic bars may stand as represented by the dotted lines L K. When the piece of steel has been thus rubbed a sufficient number of times on one side, it is then to be turned, and rubbed in like manner on the other, until it has acquired a sufficient degree of magnetism.

From considering that soft iron, or soft steel, acquires magnetism very easily, though it loses it with equal facility, Mr Cavallo was induced to suppose, that if magnetism were to be communicated to a piece of hard steel while softened by heat, and the metal were then to be hardened by pouring cold water upon it while in the act of receiving the magnetism, it was possible the virtue might be first communicated to them in a very high degree, and then be fixed by means of the hardening of the steel. To determine this matter, six magnetic bars were placed in an oblong earthen vessel, in such a manner that the north poles of three of them might be opposite to the south poles of the three others, forming two parcels of bars lying in the same direction, and about three inches asunder, which was nearly the length of the steel-bar intended to be rendered magnetic. The bar was made quite red hot, and in that state was placed between the magnetic bars. Cold water was then immediately poured upon it; by which it was hardened to such a degree that the file could not touch it; but though it had thus received a considerable degree of magnetism, the power was not superior to what might have been communicated in the ordinary way. On repeating the experiment with steel-bars of different sizes, it was found that short bars receive a proportionably greater degree of power than long ones, and that because the latter cannot be sufficiently penetrated by the magnetic power when the magnets are placed at their ends; and if a number of magnets be placed along the sides, in order to communicate a greater degree of virtue, it frequently happens that the bar acquires a number of poles. Our author is nevertheless of opinion, that this method is of considerable use: though by it we cannot communicate

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communicate any extraordinary degree of magnetism, it is yet very useful in constructing large artificial magnets. For thus they will acquire a considerable degree of power, without any additional trouble to the workman, and may then be fully impregnated in the usual way, which cannot be done without a great deal of labour when the operation is begun upon bars which have no virtue at all.

§ 2. *To communicate the Magnetic Virtue without any Magnet either natural or artificial.*

This may be done with a soft iron-bar in the manner already related, viz. by turning it in a position perpendicular to the surface of the earth, or any other excepting a line directly perpendicular to the dipping-needle. The magnetism thus acquired, however, is always weak, and is instantaneously lost; while a steel-bar will not receive any perceptible degree of magnetism by this method. But if an iron-bar be made red hot, and left to cool in the magnetic line, or if it be repeatedly struck with a hammer while in that line, it will acquire a small degree of permanent magnetism; though this also will soon vanish by leaving the bar in an improper position, or by inverting and striking it again. The magnetism lasts longer in proportion to the hardness of the iron: but a longer time will be required to give it the degree of virtue it is capable of receiving by this method. If an iron bar is left for a long time in the direction of the magnetic line, or even in a perpendicular posture, it will sometimes acquire a great degree of power. Mr Boyle makes mention of an iron-bar, ten feet long, which had acquired so much virtue by standing in this posture, that it exceeded a loadstone of three pounds and an half weight, and would turn the needle at eight or ten feet distance. Even tongs, pokers, and other kitchen utensils, by being often heated, and set to cool again in an erect posture, are frequently observed to gain a magnetic virtue. Sometimes iron-bars, which were not capable of receiving permanent magnetism on account of their softness, have, merely by exposure to the atmosphere for a great length of time, acquired a considerable degree of power; at the same time it has been remarked, that these bars became much harder by this exposure; the cause of which has not yet been discovered.

Iron or steel acquires a very perceptible degree of magnetism by drilling, hammering, or other methods by which they are put into violent action. The cause of this magnetism Mr Cavallo looks for in the earth itself, the changeable nature of the metal by heat or cold, and the vibratory motion into which its parts are accidentally put. "For the same reasons (says he) it seems that magnetism, in certain cases, is produced by electricity; the particulars observed concerning which are the following:—When the bar or needle is laid horizontally in the magnetic meridian, whichever way the shock of an electric jar or battery enters, the end of the needle which lies towards the north acquires the north polarity, viz. the power of turning towards the north when freely suspended, the other end acquiring the south polarity. If the bar before it receives the shock has some polarity, and is placed with its poles contrary to the usual direction, then its original polarity is always diminished, and sometimes re-

versed. When the needle is struck standing perpendicularly in this hemisphere, the lower end becomes the north pole, even when it had some magnetism before, and receives the shock while standing with its south pole downwards. When all other circumstances are alike, the degree of magnetism received seems to be the same, whether the needles are struck while standing horizontally in the magnetic meridian or perpendicular to the horizon. When a needle is placed in the magnetic equator, a shock through its length very seldom renders it magnetic; but if the shock be passed through its width, it acquires the virtue, the extremity which lay towards the west generally becoming the north pole. If a needle or bar strongly magnetic, or a natural magnet, be struck by the electric shock, its power is thereby diminished. When the shock is too strong, so that the needle is thereby rendered considerably hot, it acquires either no magnetism at all or a very small degree of it. Hence a stroke of lightning often renders pieces of iron or steel magnetic, as well as those bodies which naturally contain iron, as some bricks, &c."

There are various methods of communicating a permanent magnetism to ferruginous bodies, by means of a bar rendered magnetic by the earth; of which the most simple is that described by Mr Marcel, whose experiments were made in the year 1726. Being employed in making some observations on the magnetic power which he found in great pieces of iron, he took a large vice weighing 90 pounds, in which he fixed a small anvil weighing 12 pounds. The steel to which he wished to give the magnetic virtue was laid upon the anvil in a north and south position, which happened to be the diagonal of the square surface of the latter. He then took a piece of iron an inch square, and 33 inches long, weighing about eight pounds, having one end rounded and brightly polished, the other being tapered. Holding then the steel fast upon the anvil with one hand, he took the iron-bar in the other; and holding it perpendicularly, he rubbed the steel hard with the rounded part towards him from north to south, always carrying the bar far enough round about to begin again at the north. Having thus given 10 or 12 strokes, the steel was turned upside down, and rubbed as much on the other side. Proceeding in this manner till it had been rubbed 400 times, the steel was as strongly magnetic as if it had been touched by a powerful loadstone. The place where he began to rub was always the north pole. In these experiments it sometimes happened that the virtue was imparted by a few strokes; nay, by a single one, a small needle was made to receive a very considerable power. Thus he imparted to two compass-needles such a degree of magnetic power, that one took up $\frac{1}{4}$ th and another a whole ounce of iron; and though these needles were anointed with linseed oil to keep them from rusting, and a hard coat was thus formed upon them, they nevertheless retained their virtue. Thus also a knife was made so strongly magnetical, that it would take up an ounce and three quarters of iron. Four small pieces of steel, each an inch long and $\frac{1}{4}$ th of an inch broad, as thin as the spring of a watch, were thus impregnated with the magnetic virtue, and then joined into a small artificial magnet; which at its first formation took up eight times its own

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Plate CLXXVI Magnetism may be communicated to a small piece of soft steel in the following manner. Take two iron bars of about an inch square, and upwards of three feet in length, keep them in the magnetical line, or in a perpendicular posture, as represented fig. 7. Let the piece of steel CB be either fastened to the edge of a table or held by an assistant; and placing the lower extremity of the bar AB, and the upper extremity of the bar CD, on opposite sides, and in the middle of the steel, stroke the latter from the middle towards its extremities, moving both bars at the same time. When both are arrived at the extremities of the steel, remove them from it, and apply them again to the middle. Do so for 40 or 50 times, and the steel will be found to have a considerable degree of magnetic power. Care, however, must be taken, in removing the bars, not to draw them along the surface of the steel, or the experiment will not succeed, because the magnetism is destroyed by the contrary strokes.

The late Dr Godwin Knight possessed a surprising skill in magnetism, being able to communicate an extraordinary degree of attractive or repulsive virtue, and to alter or reverse the poles at pleasure; but as he refused to discover his methods upon any terms whatever (even, as he said, though he should receive in return as many guineas as he could carry), these curious and valuable secrets have died with him. In the 69th volume of the Philosophical Transactions, however, Mr Benjamin Wilson hath given a process which at least discovers one of the leading principles of Dr Knight's art, and may perhaps be a means of discovering the whole to those who shall be less reserved. The doctor's process, according to Mr Wilson, was as follows. Having provided himself with a great quantity of clean iron filings, he put them into a large tub that was more than one third filled with clean water; he then, with great labour, worked the tub to and fro for many hours together, that the friction between the grains of iron by this treatment might break off such smaller parts as would remain suspended in the water for a time. The obtaining of these very small particles in sufficient quantity seemed to him to be one of the principal desiderata in the experiment. The water being by this treatment rendered very muddy, he poured the same into a clean iron vessel, leaving the filings behind; and when the water had stood long enough to become clear, he poured it out carefully, without disturbing such of the sediment as still remained, which now appeared reduced almost to impalpable powder. This powder was afterwards removed into another vessel in order to dry it; but as he had not obtained a proper quantity thereof by this one step, he was obliged to repeat the process many times. Having at last procured enough of this very

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In the 66th volume of the Philosophical Transactions we have the following account, from Dr Fothergill, of Dr Knight's method of imitating natural magnets, but which is by Mr Cavallo supposed to be owing to some mistake or misinformation. "I do not know (says he), that ever the doctor (Dr Knight) left behind him any description of a composition he had made to form artificial loadstones. I have seen in his possession, and many other of his friends have likewise seen, such a composition; which retained the magnetic virtue in a manner much more fixed than either any real loadstone or any magnetic bar however well tempered. In the natural ones he could change the poles in an instant, so likewise in the hardest bars; but in the composition the poles were immoveable. He had several small pieces of this composition which had strong magnetic powers. The largest was about half an inch in breadth, very little longer than broad, and near a quarter of an inch thick. It was not armed, but the ends were powerfully magnetic; nor could the poles be altered, tho' it was placed between two of his largest bars, and they were very strongly impregnated. The mass was not very heavy, and had much the appearance of a piece of black lead, though not quite so shining. I believe he never divulged this composition; but I think he once told me, the basis of it was filings of iron reduced by long continued attrition to a perfectly impalpable state, and then incorporated with some pliant matter to give it due consistence."

From these accounts it appears that the basis of Dr Knight's artificial loadstones was the black powder to which iron filings are reduced by water, and which is known among the apothecaries by the name of *Martial Æthiops*: whence Mr Cavallo gives the following receipt for imitating the natural magnets.—
"Take some martial æthiops, or, which is more easily

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easily procured, reduce into very fine powder the scales of iron which fall from red-hot iron when hammered, and are found abundantly in smiths shops. Mix this powder with drying linseed oil, so as to form it into a very stiff paste, and shape it in a mould so as to give it any form you require; whether of a terrella, a human head, or any other. This done, put it into a warm place for some weeks, and it will dry so as to become very hard; then render it magnetic by the application of powerful magnets, and it will acquire a considerable power."

As to the method of making artificial magnets of steel, none has succeeded in it better than Mr Canton, whose process is as follows.

Procure a dozen of bars; six of soft steel, each three inches long, one quarter of an inch broad, and one twentieth of an inch thick; with two pieces of iron, each half the length of one of the bars, but of the same breadth and thickness: also six pieces of hard steel, each five inches and a half long, half an inch broad, and three-twentieths of an inch thick; with two pieces of iron of half the length, but the whole breadth and thickness of one of the hard bars; and let all the bars be marked with a line quite round them at one end. Then take an iron poker and tongs (fig. 8.), or two bars of iron, the larger they are and the longer they have been used, the better; and fixing the poker upright between the knees, hold to it, near the top, one of the soft bars, having its marked end downwards, by a piece of sewing silk, which must be pulled tight by the left hand, that the bar may not slide: then grasping the tongs with the right hand, a little below the middle, and holding them nearly in a vertical position, let the bar be stroked by the lower end from the bottom to the top, about ten times on each side, which will give it a magnetic power sufficient to lift a small key at the marked end: which end, if the bar was suspended on a point, would turn towards the north, and is therefore called the *north pole*; and the unmarked end is, for the same reason, called the *south pole*. Four of the soft bars being impregnated after this manner, lay the two (fig. 9.) parallel to each other, at the distance of one fourth of an inch, between the two pieces of iron belonging to them, a north and a south pole against each piece of iron: then take two of the four bars already made magnetical, and place them together so as to make a double bar in thickness, the north pole of one even with the south pole of the other: and the remaining two being put to these, one on each side, so as to have two north and two south poles together; separate the north from the south poles at one end by a large pin, and place them perpendicularly with that end downward on the middle of one of the parallel bars, the two north poles towards its south and the two south poles towards its north end: slide them backward and forward three or four times the whole length of the bar, and removing them from the middle of this, place them on the middle of the other bar as before directed, and go over that in the same manner; then turn both the bars the other side upwards, and repeat the former operation: this being done, take the two from between the pieces of iron; and, placing the two outermost of the touching bars in the room, let the other two be the outermost of the four to touch these with; and this process being repeated till each pair of bars have been

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touched three or four times over, which will give them a considerable magnetic power, put the half-dozen together after the manner of the four (fig. 10.), and touch them with two pair of the hard bars placed between their irons, at the distance of about half an inch from each other: then lay the soft bars aside; and with the four hard ones let the other two be impregnated (fig. 11.), holding the touching bars apart at the lower end near two tenths of an inch; to which distance let them be separated after they are set on the parallel bar, and brought together again before they are taken off: this being observed, proceed according to the method described above, till each pair have been touched two or three times over. But as this vertical way of touching a bar will not give it quite so much of the magnetic virtue as it will receive, let each pair be now touched once or twice over in their parallel position between the irons (fig. 12.), with two of the bars held horizontally, or nearly so, by drawing at the same time the north pole of one from the middle over the south end, and the south of the other from the middle over the north end of a parallel bar; then bringing them to the middle again, without touching the parallel bar, give three or four of these horizontal strokes to each side. The horizontal touch, after the vertical, will make the bars as strong as they possibly can be made, as appears by their not receiving any additional strength, when the vertical touch is given by a great number of bars, and the horizontal by those of a superior magnetic power. This whole process may be gone through in about half an hour; and each of the large bars, if well hardened, may be made to lift 28 Troy ounces, and sometimes more. And when these bars are thus impregnated, they will give to an hard bar of the same size its full virtue in less than two minutes; and therefore will answer all the purposes of magnetism in navigation and experimental philosophy much better than the loadstone, which is known not to have a sufficient power to impregnate hard bars. The half dozen being put into a case (fig. 13.) in such a manner as that two poles of the same denomination may not be together, and their irons with them as one bar, they will retain the virtues they have received; but if their power should, by making experiments, be ever so far impaired, it may be restored without any foreign assistance in a few minutes. And if, out of curiosity, a much larger set of bars should be required, these will communicate to them a sufficient power to proceed with; and they may, in a short time, by the same method, be brought to their full strength.

To expedite the process of making magnets, the bars should be fixed in a groove, or between brass pins, to prevent them from sliding; or they may be kept steady by means of a weight and ruler, as in fig. 11.

§ 3. *Apparatus for making Experiments in Magnetism, with an Account of various Experiments tending to illustrate and prove the Laws already laid down.*

THE apparatus necessary in magnetics is but small; consisting only of a few magnets or magnetic bars, a magnetic horizontal needle or compass, and a dipping needle. For those who do not intend to be very accurate, a common artificial horse-shoe magnet and a few sewing needles may be sufficient; but where greater accuracy is required, it will then be necessary to have

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have a good set of magnetic bars, commonly six; a few small magnetic needles, a larger needle in a box with a graduated circle, and a dipping needle; to which may be added some pieces of steel-wire, a few bars of soft iron, &c.

The magnetic bars ought to be made of the best steel, and tempered quite hard. There is not, however, any method known as yet by which we can distinguish the kind of steel which is best for magnetical purposes. It will be proper, therefore, previous to the construction of the bars, to try the quality of the metal in the following manner: Take a piece of it about three inches long and a quarter of an inch thick, no matter whether round or square; make it red-hot, and in that condition plunge it into cold water, which hardens it so that a file will not touch it. Apply then two powerful magnetic bars; holding the north pole of one to one extremity of the steel, and the south-pole of the other magnet to the other extremity of the steel. Having kept them in this position for about a minute, separate them from the steel, and then try whether it will keep suspended a key or other piece of iron which may be at hand. By treating in this manner-pieces of different steel, it will easily be perceived which is capable of lifting the greatest weight, and consequently the most proper for the construction of the bars.

Having determined the quality of the material, the next thing to be considered is the shape of the bars; for unless the length and breadth of them bear a certain proportion to each other, they will not be capable of receiving their utmost power. The best shape, according to Mr Cavallo, is when the length is ten times the breadth and 20 times the thickness. The usual dimensions are five inches in length, half an inch in breadth, and a quarter of an inch in thickness. Cylindrical bars are less convenient.—It is not absolutely necessary to polish these bars; though it will be better to do so, they being in this state much less liable to rust. One extremity is generally marked with a line all round, to distinguish one pole from another; and it is the north pole which is usually marked in this manner. When kept together, the magnetic bars must be placed alternately with the marked end of one contiguous to the unmarked end of the other. Two pieces of soft iron called *supports* always belong to each set of bars. Each of these is equal in size to the half of one of the bars; so that when placed contiguous to one another in one direction, they may equal one of the bars. These are useful when other bodies are to be rendered magnetic. For the construction of the *COMPASS* and *DIPPING-Needle*, see these articles.

Experiments with the above described Apparatus.

1. *To determine whether any substance is attracted by the magnet or not.*—If the substance to be examined contains iron, the attraction will evidently show itself on bringing near it one of the magnetic bars. The quantity of attraction will always be known by the force requisite to separate them, and its proportion is estimated by the degree of that force. Thus if two ounces are required to separate a magnet from any substance, the degree of attraction is reckoned double to that which requires only one ounce to separate them. If the attraction be so small that it can-

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not be perceived in this way, it must be put to swim upon water in an earthen or wooden vessel, by means of a piece of wood or cork. In this way the attraction will be much more easily manifested by the body coming towards the magnet when approached to it. It will sometimes be necessary to bring the magnet within one-tenth part of an inch of the body to be attracted; and as the latter advances, care must be taken to withdraw the magnet; for if they be suffered to strike against each other, the body, if hard, will generally recede; and it will likewise be proper to present the magnet to the body when the latter is at rest.

By letting the substances to be attracted swim upon quicksilver, a still smaller degree of attraction can be perceived. In using this fluid, the following particulars must be attended to. 1. The aperture of the vessel in which the quicksilver is kept must be at least six inches in diameter. The reason of this is, that, as the surface of the quicksilver descends near the sides of the vessel, the curvature of surface formed by that descent is proportionably greater in the narrow vessels than larger ones. If the vessel is only three or four inches in diameter, the body to be attracted will perpetually run from one side to another: a common soup-plate, however, will be found a very convenient vessel for this purpose. 2. It will be necessary to have the quicksilver very pure; and as it is very difficult to preserve it in that state, it must be frequently passed through a piece of writing paper rolled up conically, and having a small aperture of about $\frac{1}{10}$ th of an inch diameter in the lower part. 3. The neighbouring air must not be disturbed, that the body may be kept without motion; and, while in this state, one of the poles of the magnet is to be presented to it in the same manner as when the experiment is tried with water. It was in this manner that Mr Cavallo made his experiments on the magnetism of brass and other metals, of which we have already given an account.

If it be suspected that the given body have some magnetism already, the very same process is required; only observing to present a piece of soft and clean iron to the body when swimming upon water or quicksilver. A piece of iron about half an ounce weight, and an inch in length, will be very proper for this purpose.

2. *To find the poles of a magnetic body.*—Present the various parts of the body successively to one of the poles of a magnetic needle, and it will soon be discovered which parts of the given body are possessed of a contrary polarity by the needle's standing perpendicularly towards them. One of the poles being thus discovered, turn the opposite pole of the magnetic needle towards the body, and it will soon find out its other pole. When the magnetism of the body to be examined is very weak, there will be danger of reversing the polarity by bringing the needle too near; and as the distance at which this effect will take place cannot be determined, it will always be proper to keep it so far distant that it can only sensibly affect the needle. Where there are only two poles, they may be found out merely by sprinkling some iron-filings upon the body; for these will stand erect upon the polar points. They may be distinguished by setting the body to float in water, or tying it to a thread and letting it hang

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freely, so that one may turn towards the north and the other towards the south. This method, however, will not succeed when there are more than two poles, nor even very well in that case, unless they lie in parts directly opposite to one another.

3. *Effects of the magnet on soft iron.*—Having placed a magnetic needle upon a table, bring a bar of soft iron about eight inches long and a quarter of an inch thick, so near that it may draw one end of the needle a little out of the way. In this situation approach gradually the north pole of a magnet to the other extremity of the bar, and the north end of the needle will recede from the bar more and more in proportion as the magnet is brought nearer the bar. If the experiment be repeated with the other pole of the magnet, the north end of the needle will then be attracted by the bar. The reason of this is, that when we bring the north pole of the magnet towards one end of the bar, the latter acquires a south polarity, and the other one of course a north polarity. Hence the needle is repelled, because magnetic poles of the same kind repel one another; but when the south pole is brought near the end of the bar, that end which it approaches receives the north polarity, and the other of course the south; whence the needle, instead of being repelled, is now attracted. By approaching a small magnetic needle to different parts of the bar, it will be found that one half of it possesses one kind of polarity, and the other the contrary kind; the magnetic centre, however, or the limit betwixt the two polarities, is not always in the middle of the bar, but is generally nearer that end which is presented to the magnet. The difference increases as the bar is lengthened; and when the latter exceeds a certain length, it acquires several poles. This depends on the strength of the magnet; and when it happens, the first magnetic centre comes very near to the end of the bar which stands next the magnet, and successive centres are formed betwixt every two poles. Thus, supposing the north pole of a magnet to be brought to the end of such a bar, the end it touches becomes a south pole; a few inches farther a north polarity takes place, after that a south polarity, and so on. The poles become weaker and weaker as they recede from the end which the magnet touches; so that if the bar be of considerable length, they totally vanish long before they come to the other end. Hence, by applying a magnet to one end of a long bar, we will not thereby give any magnetism to the other; and this will happen when a magnet capable of lifting two pounds of iron is applied to a bar of about an inch square and five feet long.

4. *The action of magnetism shown by the repulsion of two pieces of wire.*—Tie two pieces of soft wire each to a separate thread, and having suspended them close by each other, bring one of the poles of a magnet under them, and they will immediately repel; the divergency becoming greater as the magnet is brought nearer within a certain limit, and will decrease as the magnet is removed. If steel-wires or common sewing needles be used, the repulsion will continue for a considerable time after the magnet is removed; and this divergency will even be greater after the removal of the magnet, as its attraction tends to draw them nearer each other; and, if brought too near, no repulsion will be shown by them. The experiment may be a-

greeably diversified by using four or more needles, and presenting a north pole to one pair and a south pole to another, &c.

5. *In what circumstances a magnet can lift the greatest weight.*—By means of a crooked wire we may show that the power of a magnet varies according to circumstances. Thus, let a piece of wire about a quarter of an inch in diameter, and four or five inches long, be bent in the manner represented by ACB, fig. 14. with a sharp corner at C. Tie it fast to a cross bar, or let it be held by an assistant with the corner downwards. Then apply either pole of the magnet DE to one of its extremities; and if in this situation a small piece of iron, as H, be put to the corner C, it will remain suspended. On applying the contrary pole of another magnet to the other extremity of the wire, the piece of iron will immediately fall off; but if a pole of the same kind be applied, it will not only be still kept suspended, but be more strongly attracted than before.

In the case just mentioned, the first magnet is assisted by the action of the second; but in order to strengthen a magnet in this manner, it does not appear necessary to use a magnet at all. Thus, having found by trial how much a magnetic bar can lift, procure an oblong piece of iron about four inches long, and somewhat heavier than the bar can bear. Apply one end of this to the pole of the bar, holding it with your hand till you place under the other end a larger piece of iron. It will then be found that the magnet will support the piece of iron which it could not do before. The lower piece of iron is to be placed between an half and three quarters of an inch below the under part of the oblong piece which hangs at the magnet. The same effect will be produced by the opposite pole of another magnet; but a pole of the same denomination would weaken the attraction.

6. *The generation of poles, and of magnetic centres in the parts of a broken magnet.*—Take a magnetic bar about six or eight inches long and a quarter of an inch diameter, whose magnetic centre will be in the middle, or near it. Break off about one third part by a smart stroke of an hammer, and it will be found that the broken part, though in the magnet it had but one polarity, will now have acquired a north and south pole, with a magnetic centre, as if it were a distinct magnet. The experiment may be diversified as follows: Having made a steel bar about six inches long and a quarter of an inch thick quite hard, break it into two unequal parts. Join these, and press them hard together, giving it the magnetic virtue at the same time by means of two powerful magnets: while the parts remain in this position, so that the bar looks as if it had not been broke, it will have only two poles; but as soon as they are separated, each part will be found to become a distinct magnet, having a north and south pole proper to itself.

7. *To remove the magnetic centre in a magnet.*—This may be done in various ways; as, by striking a magnetic bar repeatedly, heating it, hard rubbing, &c.; but in all these methods the magnetism of the bar is diminished at the same time that the centre is removed; so that they ought not to be continued beyond what is necessary to produce a sensible removal of the magnetic centre.

Plate
CCLXXVI

Practice.

Practice.

8. *The disadvantages of using magnets of unequal power, and of steel not properly hardened.*—Having communicated the magnetic virtue to a steel-bar by means of a magnet of any given power, then rub it with a weaker magnet, and it will be found, that the power of the bar, instead of being augmented, will now be diminished; being no stronger than if it had been rubbed only with the weak magnet. The impropriety of using soft steel in making artificial magnets may be understood from the following example: Take two wires about 14 inches long, and one eighth of an inch in thickness; let one be of very hard steel, the other of soft steel or iron, though not of the softest sort: then, by means of magnetic bars, give the virtue to those wires, treating them both in the same manner, and it will be generally found that the hard wire will have only two poles, but the other a greater number.

9. *To weaken or destroy the magnetism of a wire by bending.*—Having communicated the magnetic virtue to an iron or soft steel wire of about four or five inches long and one-twentieth of an inch in diameter, roll it round a stick so as to make four or five revolutions. When taken off the stick it will be found to have its virtue quite destroyed, or at least very much weakened by the bending. This effect cannot be produced but when the texture of the wire is strained by the bending; for if it be of such an elastic nature as to recover its straightness after being once rolled round the stick, little change is made on the magnetic power. When only the middle of the wire is bent, little or no change takes place in the magnetic power. If a piece of magnetic wire be cleft, or split lengthwise, the parts will sometimes have the same poles, and sometimes the contrary; but when one part is much thinner than the other, the slender part will generally have its poles reversed.

10. *To improve natural magnets.*—This may be done by the same methods which are used to communicate the virtue to steel-bars or to iron-ores: but the natural magnets being generally very short, we can seldom do more than place them between two strong magnetic bars: However, when they are of sufficient length, they must be rubbed with other bars besides those between which they are put; using the same precautions as in making artificial magnets. When subjected to this operation, it will always be proper to remove the armature from them.

11. *To arm natural or artificial magnets.*—The first step towards this operation is to find out the poles of the magnet, after which it is to be properly shaped: that of a parallelopipedon is the best: in which case care must be taken to let the poles fall about the middle of two opposite surfaces; and in this direction the magnet ought to have the greatest length possible; for a natural magnet is weakened much more by having a part cut off from its length than its breadth. This being done, provide two plates of soft iron, equal in breadth to those surfaces where the poles stand, and projecting a little on one side of the stone, as shown by fig. 15. The projections marked DD must be much narrower than the breadth of the plates; from a quarter to half an inch being sufficient for the larger magnets, and about one tenth of an inch for small ones, for the purpose of applying to them the surface of the iron F. The thickness of the plates CD CD must be

proportioned to the strength of the magnet A B; and this proportion cannot easily be determined without an actual experiment. The best method, therefore, is to make them somewhat thick at first, and then keep filing them down as long as the power of the magnet increases; after which the filing is to be discontinued. The armature may be kept on either by tying or by a box; which last is the preferable method. The armature of spherical magnets must be adapted to their shape, and each large enough to cover a quarter of it. In like manner may artificial magnets be armed, and thus a compound magnet may be produced much more powerful than any single one. Thus Dr Knight constructed two very powerful artificial magnets, or magazines of magnetic bars, which are now in the repository of the Royal Society. Each of these consists of 240 bars disposed in four lengths, so as to form a parallelopipedon, each length containing 60 bars. They are all kept together by iron braces, and the whole suspended on pivots, with a wooden pedestal or carriage, by which they may be easily placed in any required position. If the artificial magnets be made in the shape of a horse-shoe or a semicircle, they have no occasion for armature, it being sufficient to join them either by rivetting or by means of a box; and indeed even when straight bars are used, a compound magnet may be made without armature; but then as the poles cannot act in the same plain, it is necessary to have two magazines in order to give magnetism the more conveniently to other bodies. The power of a magnet is rather augmented by being armed, for the same reason that it is increased by a piece of iron affixed to it. E is a brass ring, by which it may be suspended with the iron adhering to it, which is the best method for preserving its virtue.

12. *Magnetism requires some time to penetrate through iron.* Having placed a bulky piece of iron, suppose one weighing 40 or 50 pounds, so near a magnetic needle as to draw it a little out of its direction, apply one of the poles of a strong magnet to the other extremity of the iron, and you will find that it requires some seconds before the needle can be affected by it. The interval is greater or less according to the size of the iron and the strength of the magnet.

CHAP. IV. *Entertaining Experiments.*

Construction of the MAGNETIC PERSPECTIVE-GLASS.] Provide an ivory tube, about two inches and a half long, and of the form expressed in fig. 16. CCLXXVI The sides of this tube must be thin enough to admit a considerable quantity of light. It is to open at one end with a screw; at that end there must be placed an eye-glass of about two inches focus, and at the other end any glass you please. Have a small magnetic needle, like that placed on a compass. It must be strongly touched, and so placed at the bottom of the tube that it may turn freely round. It is to be fixed on the centre of a small ivory circle C, of the thickness of a counter, which is placed on the object-glass D, and painted black on the side next it. This circle must be kept fast by a circular rim of pasteboard, that the needle may not rise off its pivot, after the same manner as in the compass. This tube will thus become a compass, sufficiently transparent to

show the motions of the needle. The eye-glass serves more clearly to distinguish the direction of the needle; and the glass at the other end, merely to give the tube the appearance of a common perspective. It will appear from the laws of magnetism already laid down, that the needle in this tube, when placed over, and at a small distance from, a magnet, or any machine in which it is contained, will necessarily place itself in a position directed by that magnet, and consequently show where the north and south pole of it is placed; the north end of the needle constantly pointing to the south end of the magnet. This effect will take place, though the magnet be inclosed in a case of wood, or even metal, as the magnetic effluvia penetrates all bodies. You must observe, however, that the attracting magnet must not be very far distant from the needle, especially if it be small, as in that case its influence extends but to a short distance. This tube may be differently constructed, by placing the needle in a perpendicular direction, on a small axis of iron, on which it must turn quite freely, between two small plates of brass placed on each side the tube: the two ends of the needle should be in exact equilibrium. The north and south ends of this needle will, in like manner, be attracted by the south and north ends of the magnetic bar. The former construction, however, appears preferable, as it is more easily excited, and the situation of the needle much more easily distinguished.

EXP. I. *The magnetic paradox.*

Plate
CCLXXVII.

HAVING placed a small piece of iron wire not above a tenth part of an inch long upon a table AB, fig. 17. Hold the magnetic bar EF about four or five inches above the table, with either of its poles pointing to the table, and so that the perpendicular let fall from the pole may touch the table at G, two or three inches from the wire; which distances, however, are subject to variations arising from the power of the magnet.—When the magnet is held in a proper position with respect to the iron, the latter will elevate one of its ends, as is shown at CD, forming an angle with the table, which is larger the nearer the wire comes to the point G, where it stands quite upright. Knock the table gently, and the wire CD will gradually proceed towards G, every knock making it jump up and advance a little way. This will naturally be attributed to the attraction of the magnet; which not being sufficiently strong to draw the wire directly towards it, is just able to bring it gradually towards G when the motion of the table lifts it up. But if, instead of holding the magnet over the table, it be placed below it at HI, the wire will now make an obtuse angle towards G; as is shown at KL, and, on knocking the table, will recede from the magnet as if repelled, though in truth it is as much attracted as before.

The cause of this seeming repulsion will be understood from fig. 18. where the wire is represented by KL and the magnet by H. The former being rendered magnetic by the proximity of the magnet H, is inclined to it according to the laws already laid down; but, by reason of its weight, and being supported only at one end, it inclines less than it would do if it were freely suspended by its centre. Let MN be a line passing through the centre of the wire; then,

by the motion of the table, the wire being lifted up, the end K will be at liberty to descend farther in the direction in which it is attracted by the magnet than it was before. It will then take the position represented by rQ, its centre remaining nearly in the same perpendicular MN. We say nearly, because the action of the magnet will undoubtedly move the whole wire somewhat nearer to itself; and the motion of the centre will be a diagonal compounded of the forces of gravity and of the magnet. The latter, however, being much smaller, will, by conspiring with the action of gravity, draw down the nearest end of the wire r so far, that a perpendicular line PO let fall from the extremity of it will touch the table in a point farther distant from the magnet than K. In this perpendicular the wire will depend very nearly, and then resume its proper situation, parallel, or nearly so, to KL; when a second knock will remove it a little farther off, for the reason already assigned. The former part of the experiment may be easily explained upon the same principles. The whole may be diversified by using iron-filings instead of the wire. In this case, when the magnet is held over the table, they will be gradually collected about the point G, and dispersed from it while the magnet is held under.

2. *The communicative crown.*

TAKE a crown-piece, and bore a hole in the side of it; in which place a piece of wire, or a large needle, well polished, and strongly touched with a magnet. Then close the hole with a small piece of pewter, that it may not be perceived. Now the needle in the magnetic perspective before described, when it is brought near to this piece of money, will fix itself in a direction correspondent to the wire or needle in that piece. Desire any person to lend you a crown-piece, which you dexterously change for one that you have prepared as above. Then give the latter piece to another person, and leave him at liberty either to put it privately in a snuff-box, or not; he is then to place the box on a table, and you are to tell him, by means of your glass, if the crown is or is not in the box. Then bringing your perspective close to the box, you will know, by the motion of the needle, whether it be there or not; for as the needle in the perspective will always keep to the north of itself, if you do not perceive it has any motion, you conclude the crown is not in the box. It may happen, however, that the wire in the crown may be placed to the north, in which case you will be deceived. Therefore, to be sure of success, when you find the needle in the perspective remain stationary, you may make some pretence to desire the person to move the box into another position, by which you will certainly know if the crown-piece be there or not.—You must remember, that the needle in the perspective must here be very sensible, as the wire in the crown cannot possibly have any great attractive force.

3. *The magnetic table.*

UNDER the top of a common table place a magnet that turns on a pivot; and fix a board under it, that nothing may appear. There may also be a drawer under the table, which you pull out to show that there is nothing concealed. At one end of the table there must

Plate CCLXXVII.

Plate CCLXXVII.

Fig. 17.

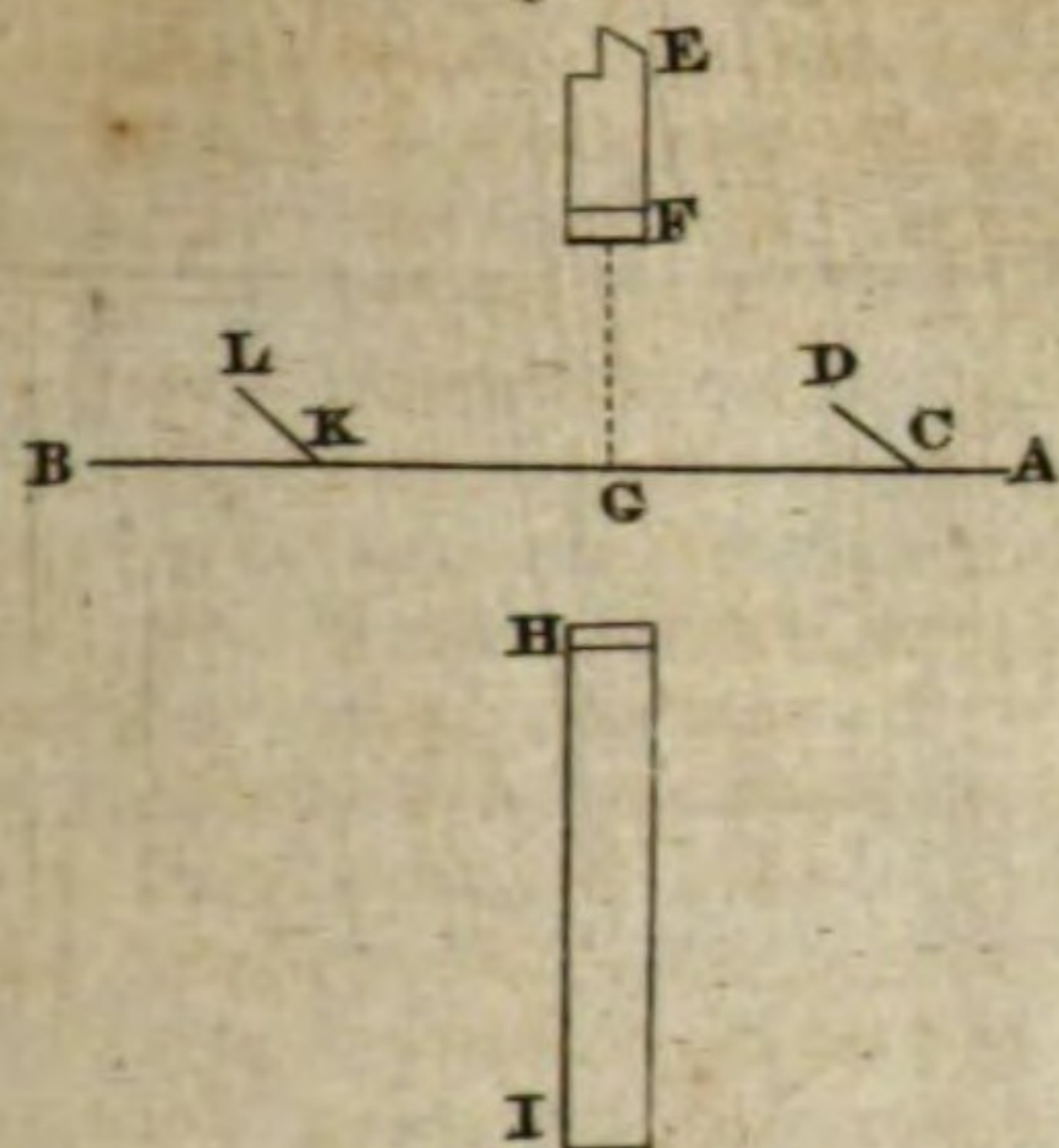


Fig. 18.

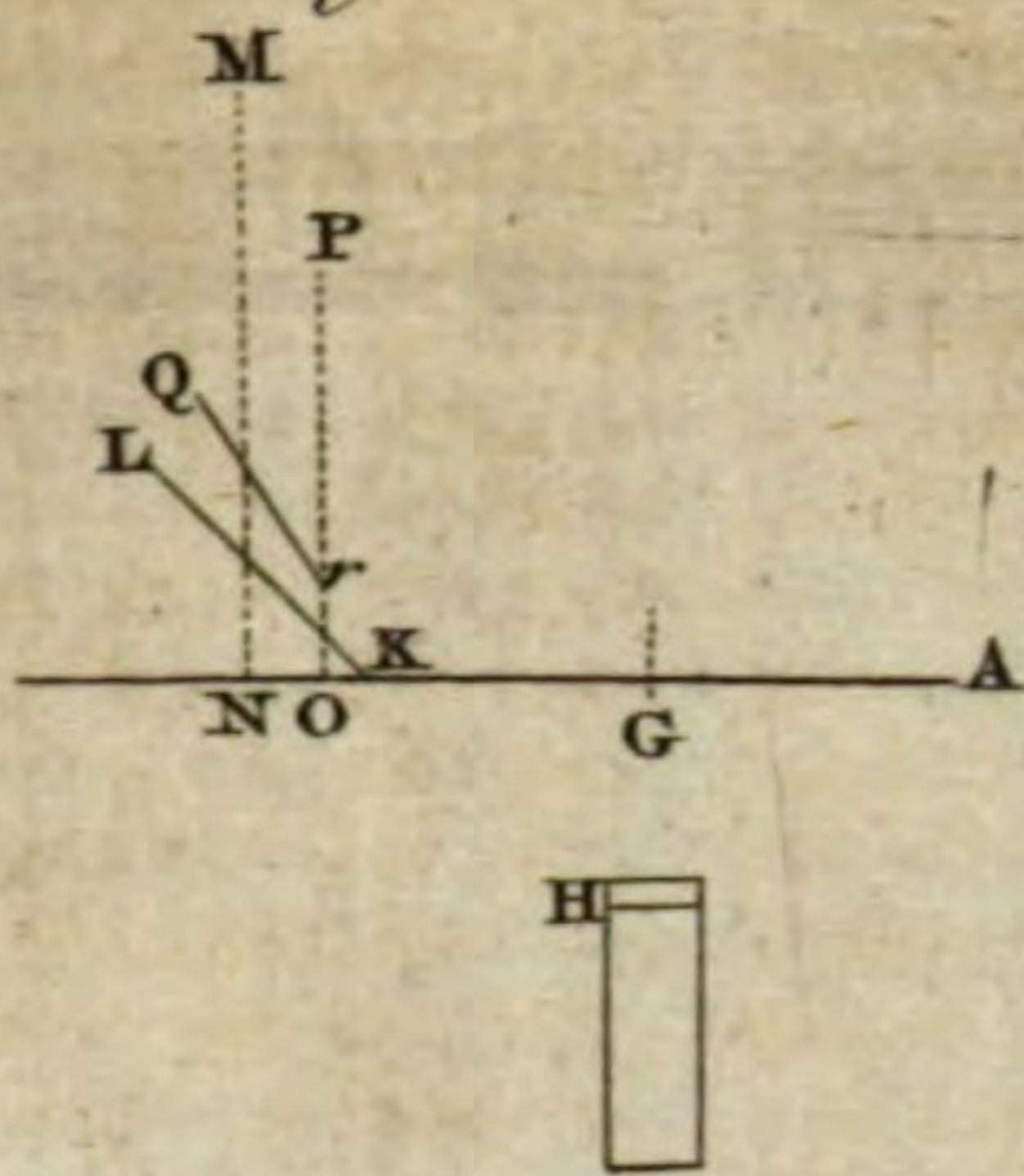


Fig. 19.

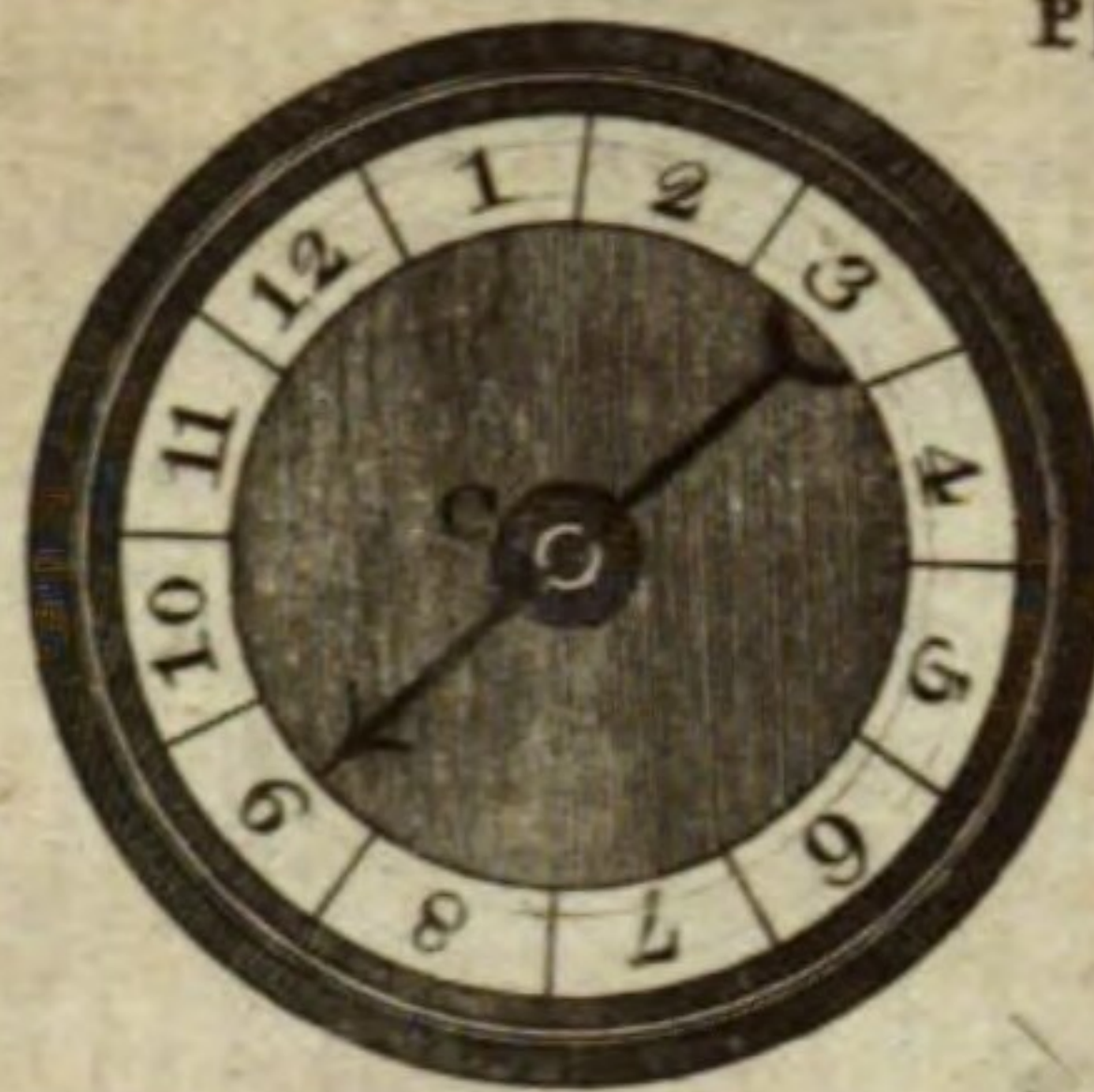


Fig. 20.

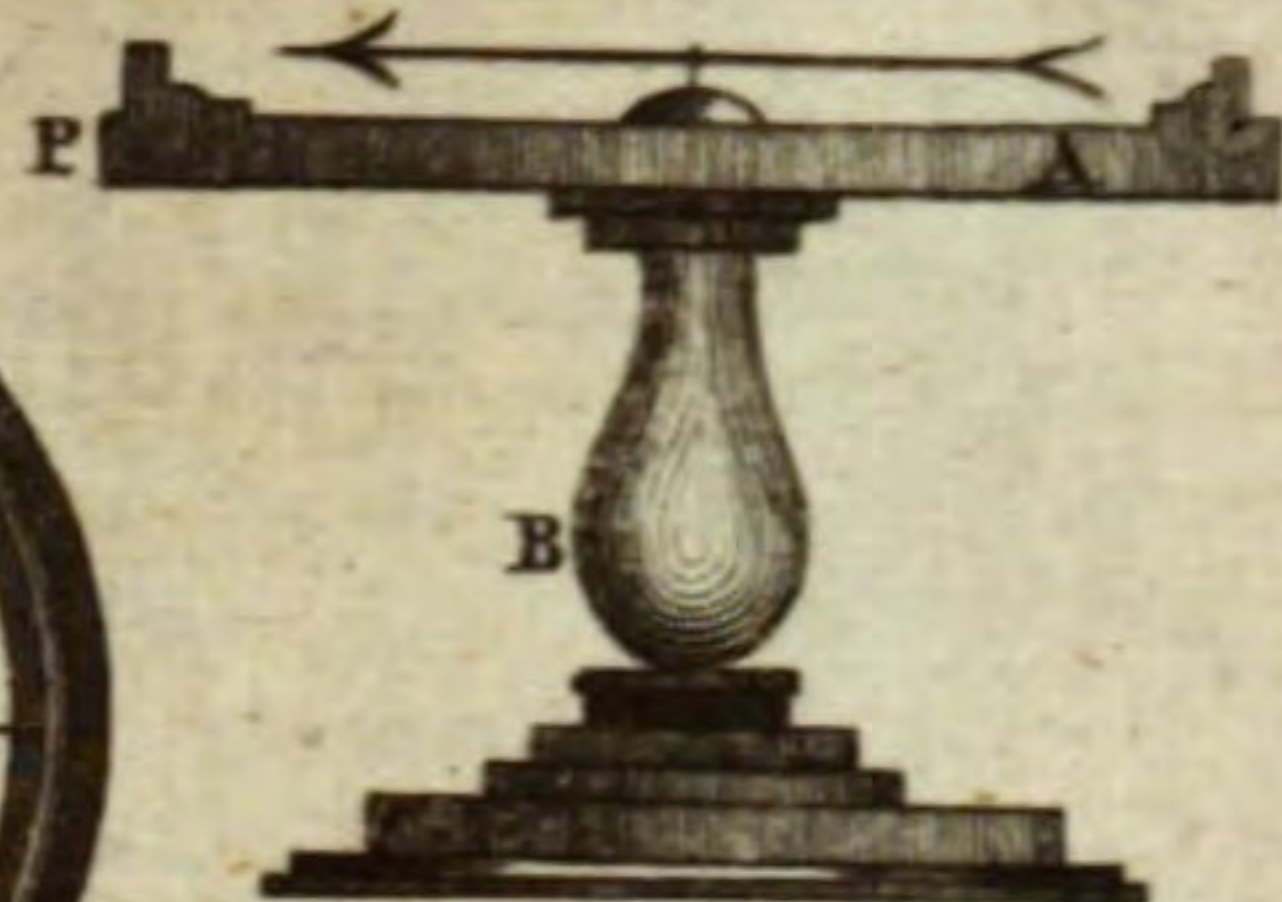


Fig. 21.



Fig. 22.

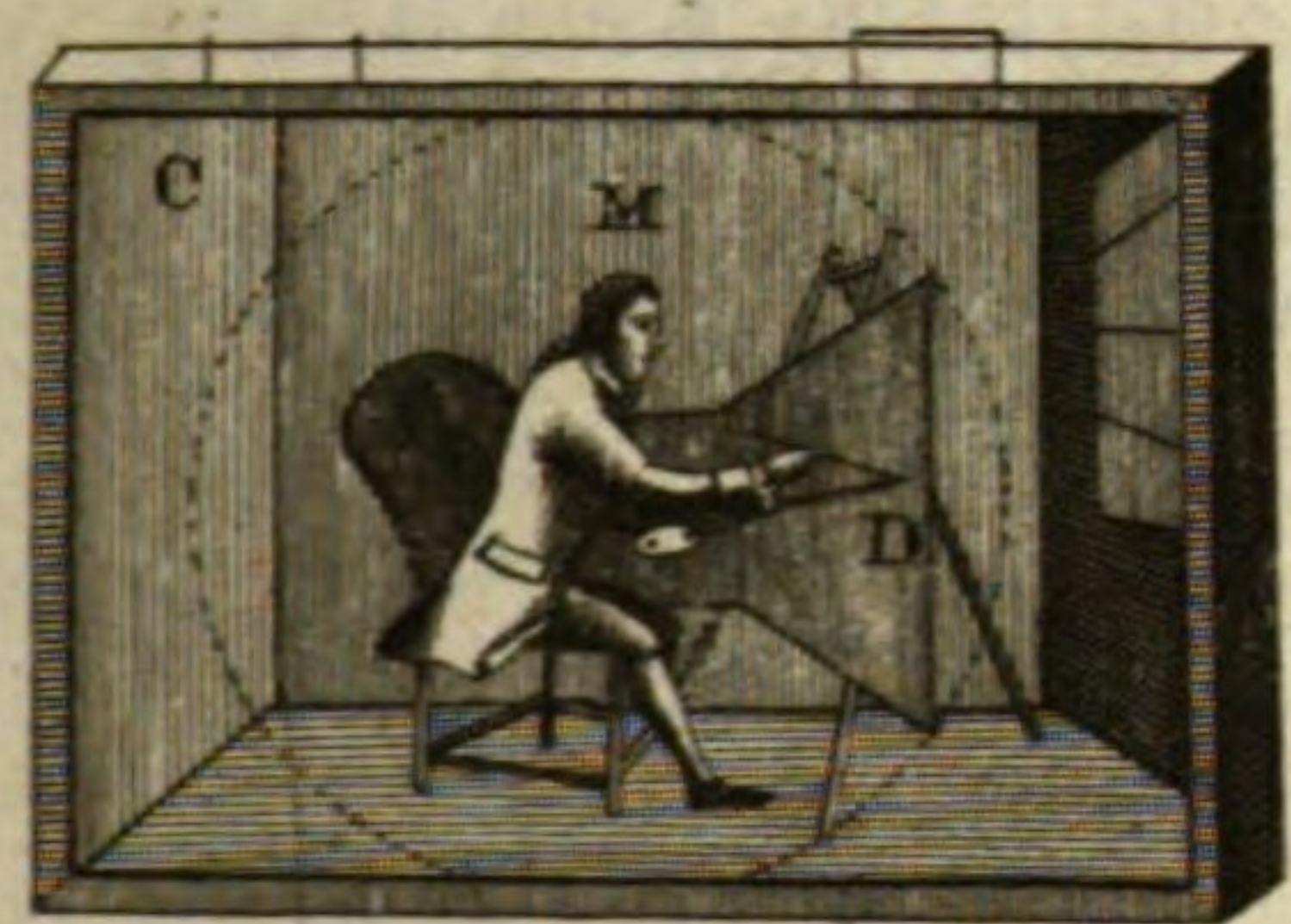


Fig. 23.

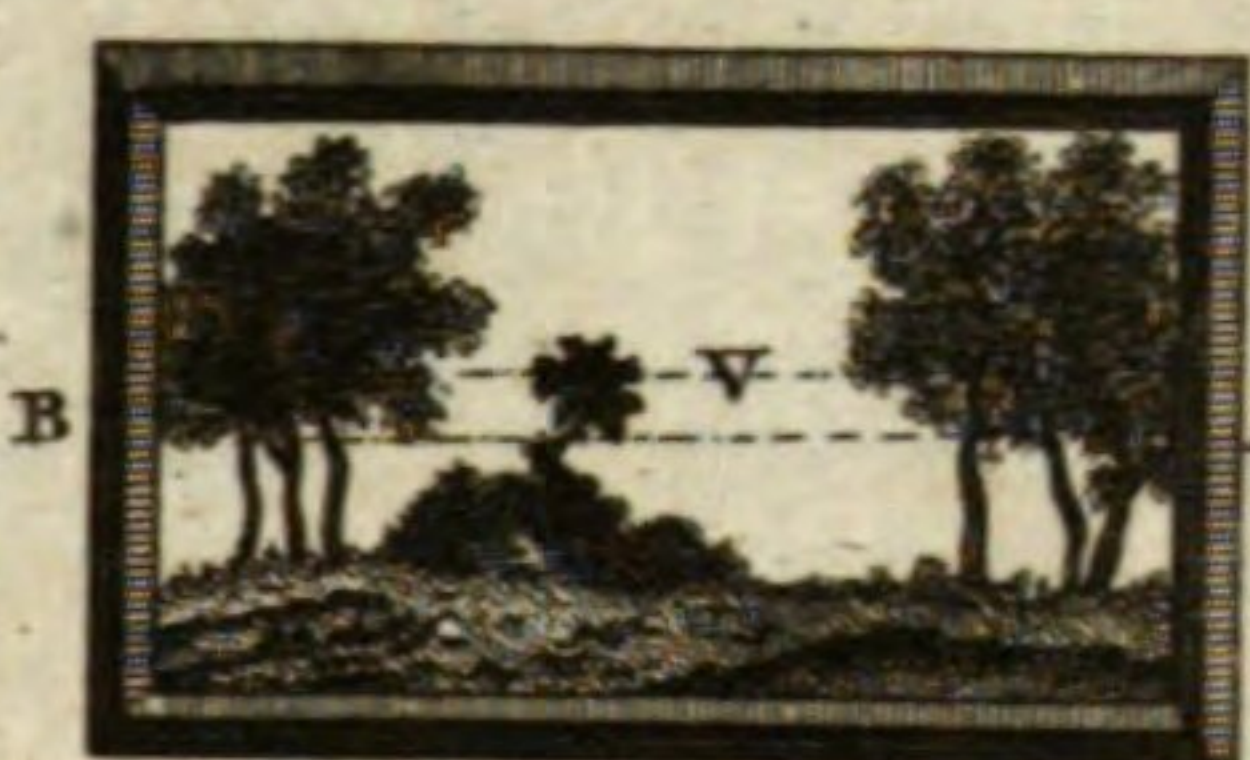


Fig. 25.



Fig. 27.



Fig. 24.



Fig. 26.



Fig. 28.

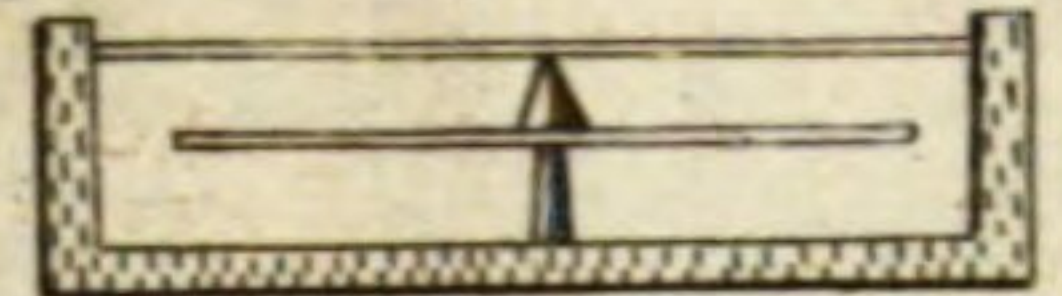


Fig. 29.

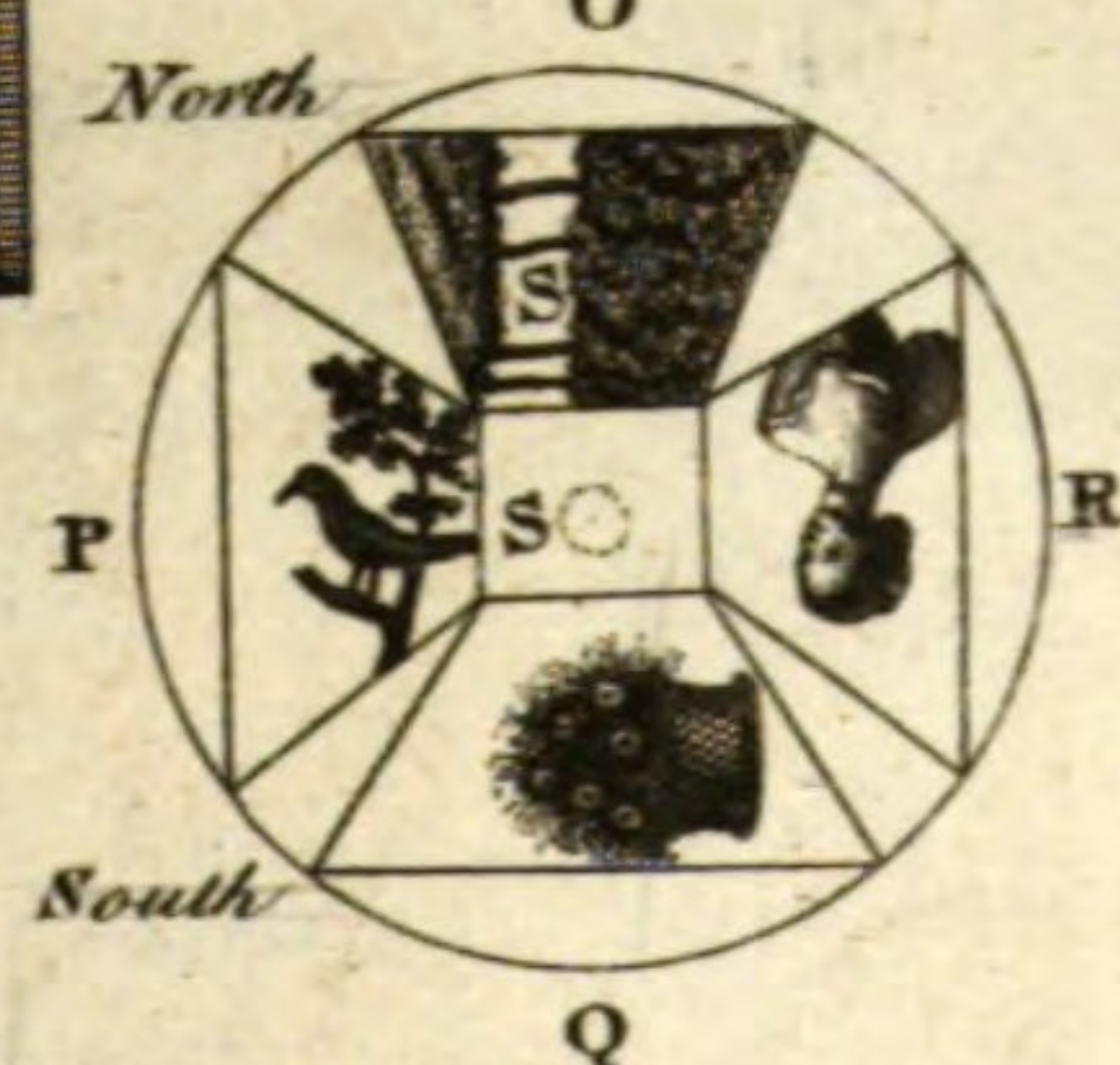


Fig. 30.



Fig. 31.



Fig. 33.



Fig. 34.

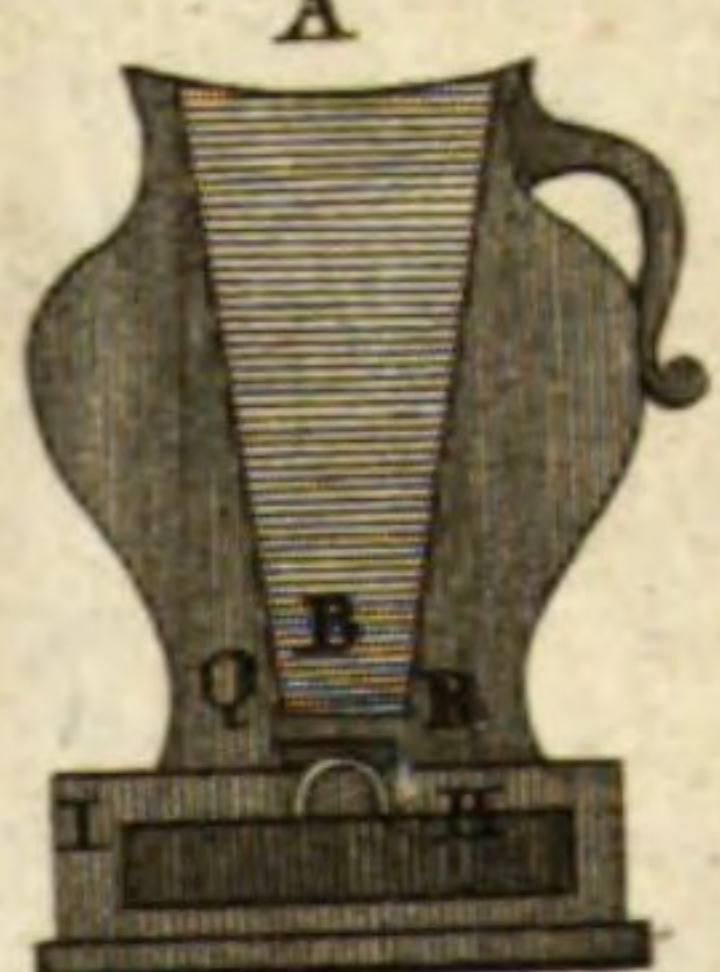


Fig. 35.



N^o. 1. *North*



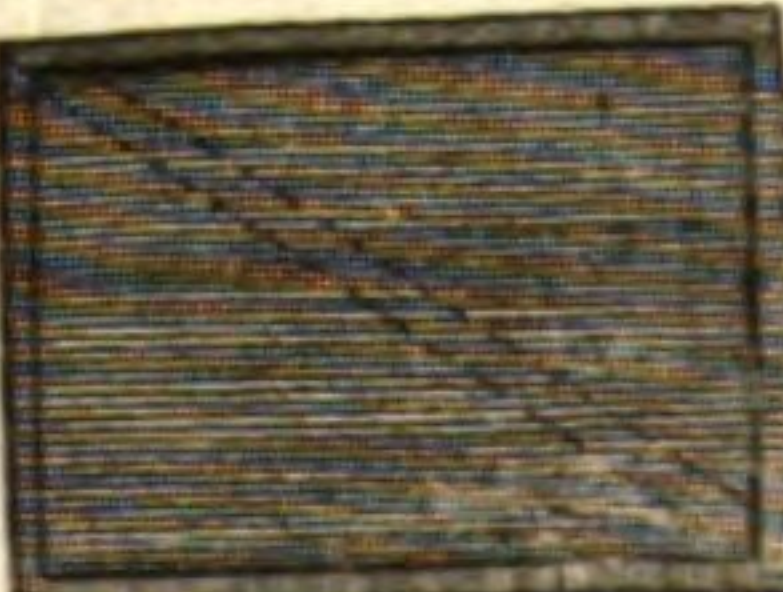
North N^o. 2.



N^o. 3. *North*



South N^o 4.



A. Bell Pin. M. A. Sculptor fecit.

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must be a pin that communicates with the magnet, and by which it may be placed in different positions: this pin must be so placed as not to be visible to the spectators. Strew some steel-filings or very small nails over that part of the table where the magnet is. Then ask any one to lend you a knife, or a key, which will then attract part of the nails or filings. Then placing your hand in a careless manner on the pin at the end of the table, you alter the position of the magnet; and giving the key to any person, you desire him to make the experiment, which he will then not be able to perform. You then give the key to another person; at the same time placing the magnet, by means of the pin, in the first position, when that person will immediately perform the experiment.

4. *The mysterious watch.*

You desire any person to lend you his watch, and ask him if he thinks it will or will not go when it is laid on the table. If he say it will, you place it over the end of the magnet, and it will presently stop (A). You then mark with chalk, or a pencil, the precise point where you placed the watch; and moving the position of the magnet, as in the last experiment, you give the watch to another person, and desire him to make the experiment; in which he not succeeding, you give it to a third person, at the same time replacing the magnet, and he will immediately perform the experiment.

5. *The magnetic dial.*

PROVIDE a circle of wood or ivory, of about five or six inches diameter, as fig. 19. which must turn quite free on the stand B (fig. 20.) in the circular border A: on the circle must be placed the dial of pasteboard C (fig. 19.) whose circumference is to be divided into 12 equal parts, in which must be inscribed the numbers from 1 to 12, as on a common dial. There must be a small groove in the circular frame D, to receive the pasteboard circle: and observe, that the dial must be made to turn so free, that it may go round without moving the circular border in which it is placed. Between the paste-board circle and the bottom of the frame, place a small artificial magnet E (fig. 21.), that has a hole in its middle, or a small protuberance. On the outside of the frame place a small pin P, which serves to show where the magnetic needle I, that is placed on a pivot at the centre of the dial, is to stop. This needle must turn quite free on its pivot, and its two sides should be in exact equilibrium. Then provide a small bag, that has five or six divisions, like a lady's work-bag, but smaller. In one of these divisions put small square pieces of pasteboard, on which are wrote the numbers from 1 to 12, and if you please you may put several of each number. In each of the other divisions you must put 12 or more like pieces; observing, that all the pieces in each division must be marked with the same number. Now the needle being placed upon its pivot, and turned quickly about, it will necessarily stop at that point where the north end of the magnetic bar is placed, and which you previously know by the situation of the small pin in the circular border. You therefore pre-

sent to any person that division of the bag which contains the several pieces on which is wrote the number opposite to the north end of the bar, and tell him to draw any one of them he pleases. Then placing the needle on the pivot, you turn it quickly about, and it will necessarily stop, as we have already said, at that particular number.

Another experiment may be made with the same dial, by desiring two persons to draw each of them one number out of two different divisions of the bag; and if their numbers, when added together, exceed 12, the needle or index will stop at the number they exceed it; but if they do not amount to 12, the index will stop at the sum of those two numbers. In order to perform this experiment, you must place the pin against the number 5, if the two numbers to be drawn from the bag be 10 and 7; or against 9 if they be 7 and 2.—If this experiment be made immediately after the former, as it easily may, by dexterously moving the pin, it will appear the more extraordinary.

6. *The dexterous painter.*

PROVIDE two small boxes, as M and N (fig. 22), four inches wide, and four inches and a half long. Let the box M be half an inch deep, and N two-thirds of an inch. They must both open with hinges, and shut with a clasp. Have four small pieces of light wood, (fig. 23, 24, 25, 26.) of the same size with the inside of the box M (fig. 22.), and about one third of an inch thick. In each of these let there be a groove, as AB, EF, CD, GH; these grooves must be in the middle, and parallel to two of the sides. In each of these grooves place a strong artificial magnet, as fig. 27. The poles of these magnets must be properly disposed with regard to the figures that are to be painted on the boards; as is expressed in the plate. Cover the bars with paper, to prevent their being seen; but take care, in pasting it on, not to wet the bars, as they will thereby rust, which will considerably impair their virtue. When you have painted such subjects as you choose, you may cover them with a very thin clear glass. At the centre of the box N, place a pivot (fig. 28.), on which a small circle of pasteboard OPQR (fig. 29.) is to turn quite free; under which is to be a touched needle S. Divide this circle into four parts, which are to be disposed with regard to the poles of the needle, as is expressed in the figure. In these four divisions you are to paint the like subjects as are on the four boards, but reduced to a smaller compass. Cover the inside of the top of this box with a paper M, (see fig. 22.) in which must be an opening D, at about half an inch from the centre of the box, that you may perceive, successively, the four small pictures on the pasteboard circle just mentioned. This opening is to serve as the cloth on which the little painter is supposed to draw one of the pictures. You may cover the top of the box, if you please, with a thin glass. Then give the first box to any person, and tell him to place any one of the four pictures in it privately, and, when he has closed it, to give it you. You then place the other box over it; when the moveable circle, with the needle, will turn till it comes in the same position with the bar in the first.

(A) To perform this experiment, you must use a strong magnetic bar; and the balance of the watch must not be of brass, but steel.

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first box. It will then appear that the little dexterous painter has already copied the picture that is inclosed in the first box.

7. *The cylindric oracle.*

PROVIDE a hollow cylinder of about six inches high and three wide, as AB, fig. 30. Its cover CD must be made to fix on any way. On one side of this box or cylinder let there be a groove, nearly of the same length with that side; in which place a small steel bar (fig. 31.) that is strongly impregnated, with the north pole next the bottom of the cylinder. On the upper side of the cover describe a circle; and divide it into ten equal parts, in which are to be wrote the numbers from 1 to 10, as is expressed in fig. 32. Place a pivot at the centre of this circle, and have ready a magnetic needle. You are then to provide a bag, in which there are several divisions, like that described in exper. 5. In each of these divisions put a number of papers, on which the same or similar questions are wrote. In the cylinder put several different answers to each question, and seal them up in the manner of small letters. On each of these letters or answers is to be wrote one of the numbers of the dial or circle at the top of the box. You are supposed to know the number of the answers to each question. You then offer one of the divisions of the bag, observing which division it is, to any person, and desire him to draw one of the papers. Next put the top on the cylinder, with that number which is wrote on the answer directly over the bar. Then placing the needle on the pivot, you turn it briskly about, and it will naturally stop at the number over the bar. You then desire the person who drew the question to observe the number at which the needle stands, and to search in the box for a paper with the same number, which he will find to contain the answer.—You may repeat the experiment by offering another division of the bag to the same or another person; and placing the number that corresponds to the answer over the magnetic bar, proceed as before.

It is easy to conceive of several answers to the same question. For example, suppose the question to be, Is it proper to marry?

Answer 1. While you are young, not yet; when you are old, not at all.

2. Marry in haste, and repent at leisure.

3. Yes, if you can get a good fortune; for something has some favour, but nothing has no flavour.

4. No, if you are apt to be out of humour with yourself; for then you will have two persons to quarrel with.

5. Yes, if you are sure to get a good husband (wife); for that is the greatest blessing of life. But take care you are sure.

6. No, if the person you would marry is an angel; unless you will be content to live with the devil.

8. *The enchanted ewer.*

Fix a common ewer, as A, (fig. 33.) of about 12 inches high, upon a square stand BC; in one side of which there must be a drawer D, of about four inches square and half an inch deep. In the ewer place a hollow tin cone, inverted, as AB, fig. 34. of about four inches and a half diameter at top, and

two inches at bottom; and at the bottom of the ewer there must likewise be a hole of two inches diameter.

Upon the stand, at about an inch distance from the bottom of the ewer, and directly under the hole, place a small convex mirror H, of such convexity that a person's visage, when viewed in it, at about 15 inches distance, may not appear above two inches and a half long.

Upon the stand likewise, at the point I, place a pivot of half an inch high, on which must be fixed a touched needle RQ, inclosed in a circle of very thin pasteboard OS, fig. 35. of five inches diameter. Divide this pasteboard into four parts, in each of which draw a small circle: and in three of these circles paint a head as x, y, z, the dress of each of which is to be different, one, for example, having a turban, another a hat, and the other a woman's cap. Let that part which contains the face in each picture be cut out, and let the fourth circle be entirely cut out; as it is expressed in the figure. You must observe, that the poles of the needle are to be disposed in the same manner as in the plate.

You are next to provide four small frames of wood or pasteboard, n^o 1, 2, 3, 4, each of the same size with the inside of the drawer. On these frames must be painted the same figures as on the circular pasteboard; with this difference, that there must be no part of them cut out. Behind each of these pictures place a magnetic bar, in the same direction as is expressed in the plate; and cover them over with paper, that they may not be visible. Matters being thus prepared, you first place in the drawer the frame n^o 4. on which there is nothing painted. You then pour a small quantity of water into the ewer, and desire the company to look into it, asking them if they see their own figures as they are. Then you take out the frame n^o 4. and give the three others to any one, desiring him to choose in which of those dresses he would appear. Then put the frame with the dress he has chose in the drawer; and a moment after, the person looking into the ewer will see his own face surrounded with the dress of that picture. For, the pasteboard circle (divided, as above described, into four parts, in three of which are painted the same figures as on three of the boards, and the fourth left blank) containing a magnetic needle, and the four boards having each a concealed magnet; therefore, when one of them is put in the drawer under the ewer, the circle will correspond to the position of that magnet, and consequently the person looking into the top of the ewer will see his own face surrounded with the head-dress of the figure in the drawer.—This experiment, well performed, is highly agreeable. As the pasteboard circle can contain only three heads, you may have several such circles, but you must then have several other frames: and the ewer must be made to take off from the stand.

9. *The box of metals.*

PROVIDE a wooden box, about 13 inches long and seven wide, as ABCD (fig. 36.). The cover of this box should be as thin as possible. Have six small boxes or tables, about an inch deep, all of the same size and form, as EFGHIK, that they may indiscrimi-

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ments.Plate
CCLXXVIII

nately go into similar holes made in the bottom of the large box. In each of these tablets is to be placed a small magnetic ball, and their poles are to be disposed as expressed in the figure. Cover each of these tablets with a thin plate of one of the six following metals, viz. gold, silver, copper, iron, pewter, and lead. You must also have a magnetic perspective, at the end of which is to be two circles, one divided into six equal parts, and the other into four, as in fig. 37. from the centre of which there must be drawn an index N, whose point is to be placed to the north. Therefore, when you are on the side CD of the box, and hold your perspective over any one of the tablets that are placed on the holes E, F, G, so that the index drawn on the circle is perpendicular to the side AB, the needle in the perspective will have its south pole directed to the latter that denotes the metal contained in that tablet. When you hold the perspective over one of the boxes placed in the holes H, I, K, so that the index drawn on the circle is perpendicular to the side CD, the south pole of the needle will in like manner express the name of the metal inclosed. If the under side of any one of the tablets be turned upwards, the needle will be slower in its motion, on account of the greater distance of the bar. The gold and silver will still have the same direction; but the four other metals will be expressed by the letters on the interior circle. If any one of the metals be taken away, the needle will not then take any of the above directions, but naturally point to the north; and its motion will be much slower. You therefore give the box to any one, and leave him at liberty to dispose all the tablets in what manner and with what side upward he please, and even to take any one of them away. Then, by the aid of your perspective, you tell him immediately the name of the metal on each tablet, and of that he has taken away.

This box of metals will, on comparison, be found far to exceed that which has been publicly exhibited: for that, being composed of six tablets, of which two only differ in form, admits but of six different dispositions, whereas in this the tablets may be placed 720 different ways. In the other, you must also know the particular side of the box, which in this is not at all necessary. Nay, you may here distinguish each metal, though the box be completely covered with paper; for the effect of the needle will be always the same. The experiments with this box are therefore much more extraordinary, and its construction at the same time more simple.

10. *The magnetic planetarium.*

CONSTRUCT a round box, ILMN, (fig. 38,) of eight or nine inches diameter, and half an inch deep. On its bottom fix a circle of pasteboard, on which draw the central circle A, and the seven circumjacent circles B, C, D, E, F, G, H. Divide the central circle into seven equal parts by the lines AB, AC, AD, AE, AF, AG, and AH, which must pass through the centres of the other circles, and divide each of them into two equal parts. Then divide the circumference of each of those circles into 14 equal parts, as in the figure. You are likewise to have another pasteboard of the same figure, and divided in the same manner,

which must turn freely in the box by means of an axis placed on a pivot; one end of which is to be fixed in the centre of the circle A. (See fig. 39.) On each of the seven smaller circles at the bottom of the box, place a magnetic bar, two inches long, in the same direction with the diameters of those circles, and their poles in the situations expressed in the figure. There must be an index O (fig. 39.), like that of the hour-hand of a dial, which is to be fixed on the axis of the central circle, and by which the pasteboard circle in the box may be turned about. There must be also a needle P, which must turn freely on the axis, without moving the circular pasteboard.—In each of the seven divisions of the central circle write a different question; and in another circle, divided into 12 parts, you may write the names of the 12 months. In each of the seven circles write two answers to each question, observing that there must be but seven words in each answer; in the following manner. In the first division of the circle G fig. 37. which is opposite to the first question, write the first word of the first answer. In the second division of the next circle, write the second word; and so on to the last word, which will be in the seventh division of the seventh circle. In the eighth division of the first circle, write the first word of the second answer; in the ninth division of the second circle, write the second word of the same answer; and so on to the 14th division of the seventh circle, which must contain the last word of that answer. The same must be done for all the seven questions; and to each of them must be assigned two answers, the words of which are to be dispersed through the seven circles. At the centre of each of these circles place a pivot; and have two magnetic needles, the pointed end of one of which must be north, and the other south, QR, (fig. 39.) Now, the index of the central circle being directed to any one of the questions, if you place one of the two magnetic needles on each of the seven lesser circles, they will fix themselves according to the direction of the bars on the correspondent circles at the bottom of the box, and consequently point to the seven words that compose the answer. If you place one of the other needles on each circle, it will point to the words that are diametrically opposite to those of the first answer, the north pole being in the place of the south pole of the other.—You therefore present this planetarium to any person, and desire him to choose one of the questions there wrote; and you then set the index of the central circle to that question, and putting one of the needles on each of the seven circles, you turn it about; and when they all settle, they will point to the seven words that compose the answer. The two answers may be one favourable and the other unfavourable; and the different needles will serve to diversify the answers when you repeat the experiment.

There may be also a moveable needle to place against the names of the months; and when the party has fixed upon a question, you place that needle against the month in which he was born, which will give the business an air of more mystery. On the centre of the large circle may be the figure of the sun; and on each of the seven smaller circles one of the characters of the five planets, together with the earth and moon. This

expe-

Entertain-
ing Experi-
ments.

experiment, well executed, is one of the most enter-
taining that magnetism has produced.

11. *The sagacious swan.*

Plate
CCLXXVIII.
Fig. 40.

PROVIDE a box XY, 18 inches long, 9 wide, and 2 deep, the top of which is to slide on and off at the end Y. Toward the end X, describe a circle of six inches diameter, round which are to be fixed six small vases of wood or ivory, of one inch and a half high; and to each of them there must be a cover. At the end Y place an egg B, of ivory or other matter, of about three inches and a half high, with a cover that shuts by a hinge, and fastens with a spring. It must be fixed on the stand C; through which, as well as the bottom of the egg, and the part of the box directly underneath, there must pass a hole of one-third of an inch in diameter. In this cavity place an ivory cylinder F, that can move freely, and rises or falls by means of the spring R. You must have a thin copper basin A, of six inches diameter, which is to be placed on the centre of the circle at X, and consequently in the middle of the six vases. Let a proper workman construct the movement expressed by fig. 41. which is composed of a quadrant G, that has 16 teeth, and is moveable about an axis in the stand H, that has an elbow, by which it is screwed to the bottom of the box at L. To the quadrant there must be joined the straight piece K. The horizontal wheel M has 24 teeth; and is supported by the piece S, which is screwed to the end of the box next Y. On the axis of this wheel place a brass rod OP, five inches long; and at the part O place a large bar or horse-shoe, of a semi-circular form, and about two inches and a half diameter, strongly impregnated. The steel rod V, takes at one end the teeth of the quadrant G, by the pinion F, and at the other end the wheel M, by the perpendicular wheel N, of 30 teeth; the two ends of this rod are supported by the two stands that hold the other pieces. Under the piece K, that joins to the quadrant, must be placed the spring R, by which it is raised, and pushes up the cylinder that goes through the stand C into the egg. You must also have six small etwees or cases, as Y, Y, Y, Y, Y, Y. They must be of the same circumference with the cylinder in the stand, and round at their extremities: their length must be different, that, when they are placed in the egg, and the lower end enters the hole in which is the cylinder, they may thrust it down more or less, when the top of the egg, against which they press, is fastened down; and thereby lower the bar that is fixed to the end of the quadrant, and consequently, by means of the pinion Z and wheels NM turn the horse-shoe that is placed upon the axis of the last wheel. The exact length of these etwees can be determined by trials only; which trials, however, may be made with round pieces of wood. In each of these etwees place a different question, wrote on a slip of paper and rolled up, and in each of the vases put the answer to one of the questions; as you will know, by trials, where the magnetic bar or horse-shoe will stop. Lastly, provide a small figure of a swan, or what other you please, made of cork or enamel, in which you must fix a touched needle, of the largest size of those commonly used in sewing.

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ing Experi-
ments.

Being thus prepared, you offer a person the six etwees, and desire him to choose any one of them himself, and conceal the others, or give them to different persons. He is then to open his etwee, read the question it contains to himself, and return the etwee to you, after replacing the question. You then put the etwee in the egg, and placing the swan upon the water in the basin, you tell the company she will presently discover in which of the vases the answer is contained. The same experiment may be repeated with all the etwees.

12. *The multifarious verse.*

THE eight words that compose this Latin verse,
Tot sunt tibi dotes, quot cali sidera, virgo (A),
being privately placed in any one of the different combinations of which they are susceptible, and which are 40320 in number, to tell the order in which they are placed.

Provide a box that shuts with hinges, and is eight inches long, three wide, and half an inch deep. Have eight pieces of wood about one third of an inch thick, two inches long, and one and a half wide, which will therefore, when placed close together, exactly fill the box. In each of these pieces or tablets place a magnetic bar, with their poles as is expressed in the figure. The bars being covered over, write on each of the tablets, in the order they then stand, one of the words of the foregoing Latin verse. On a very thin board of the same dimensions with the box, draw the eight circles, A, B, C, D, E, F, G, H, (fig. 43.) whose centres should be exactly over those of the eight tablets in the box when the board is placed upon it. Divide each of those circles into eight parts, as in the figure; and in each of those divisions write one of the words of the Latin verse, and in the precise order expressed in the plate; so that, when the board is placed over the box, the eight touched needles placed at the centre of the circles may be regulated by the poles of the bars in the box, and consequently the word that the needle points to in the circle be the same with that inscribed on the tablet. Cover the board with a glass, to prevent the needles from rising off their pivots, as is done in the sea-compass. Over the board place four plates of glass, I, L, M, N, fig. 44. which will give the machine the figure of a truncated pyramid, of eight inches high. Cover it with a glass, or rather a board, in which are placed two lenses, O O, of eight inches focus, and distant from each other about half an inch. Line the four plates of glass that compose the sides with very thin paper, that will admit the light, and at the same time prevent the company from seeing the circles on the board.

These preparations being made, you give the box to any one; and tell him to place the tablets on which the words are wrote, privately, in what position he thinks proper, then to close the box; and, if he please, to wrap it up in paper, seal it, and give it you. Then placing the board with the pyramid upon it, you immediately tell him the order in which the tablets are placed, by reading the words to which the needles on the circles point.

MAG-

(A) i. e. Thy virtues, virgin, are as numerous as the stars of heaven.

Fig. 37.



Fig. 38.

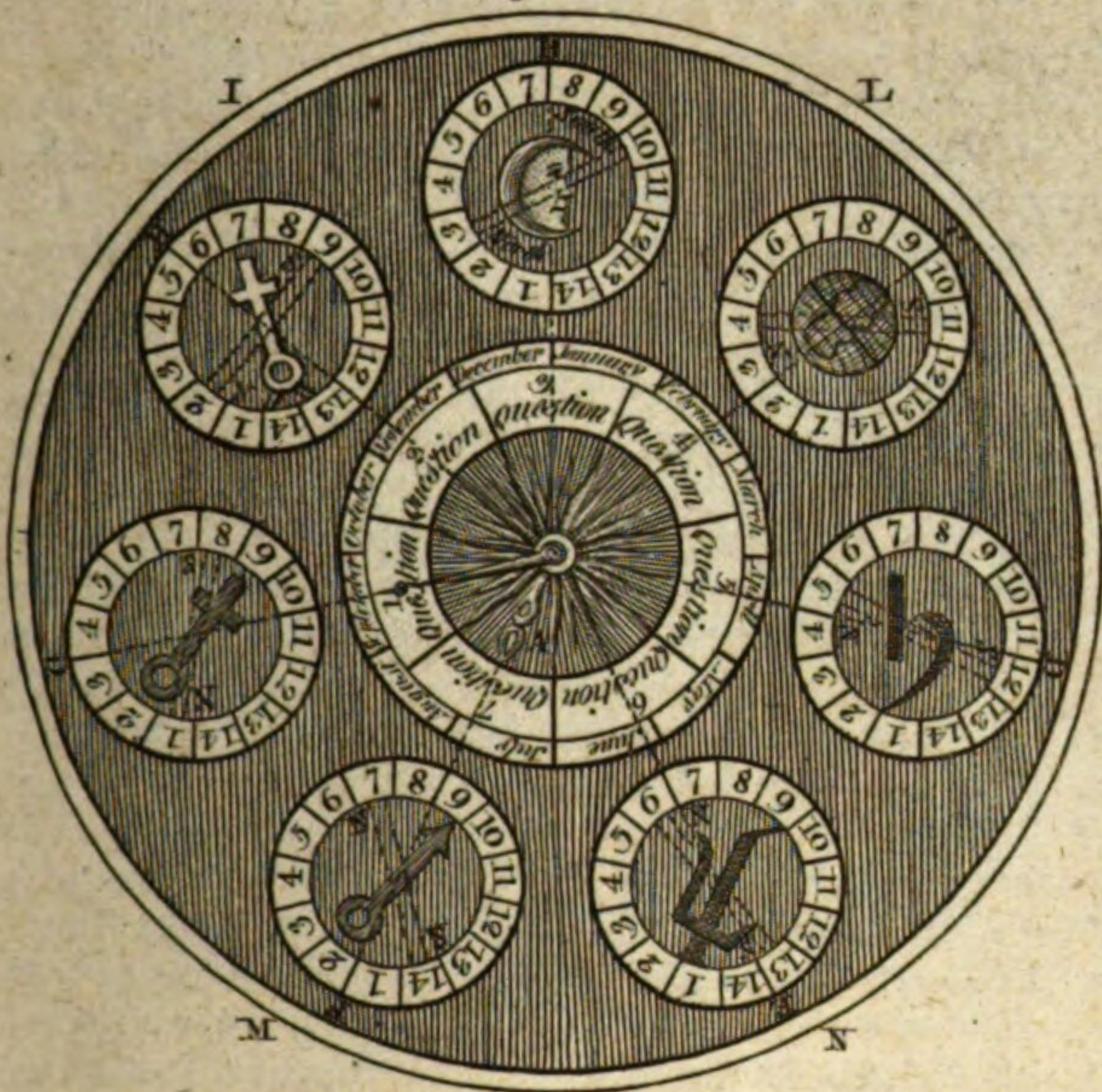


Fig. 40.

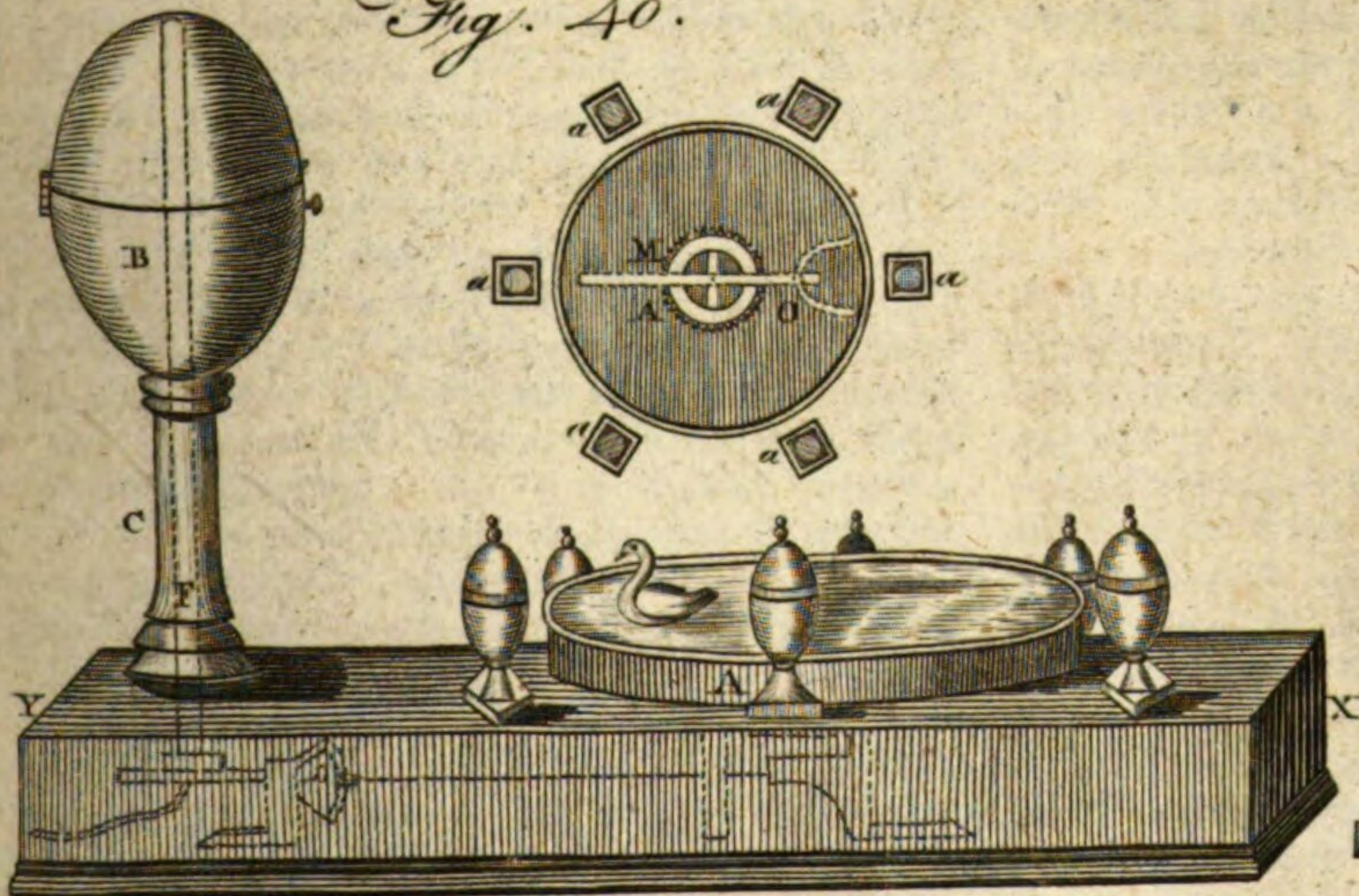


Fig. 42.

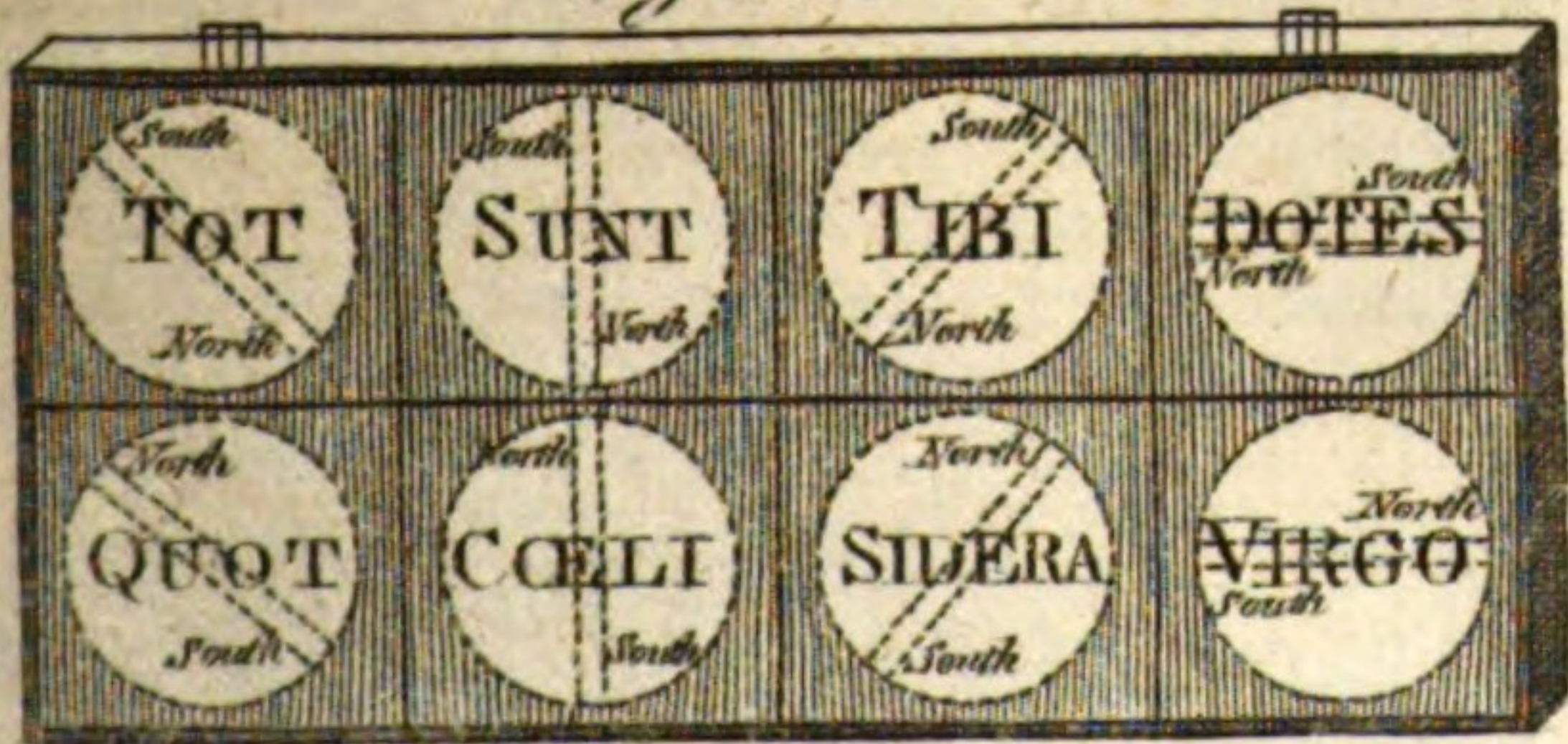


Fig. 39.

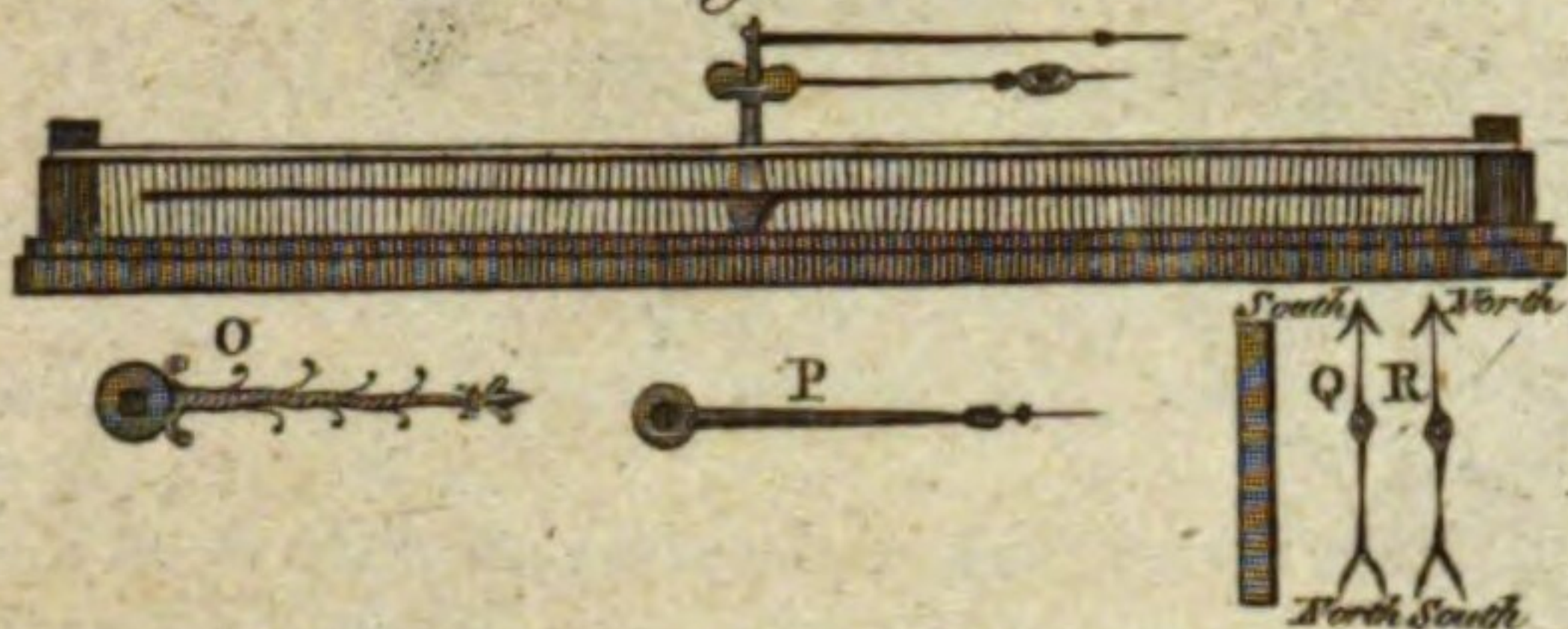


Fig. 41.

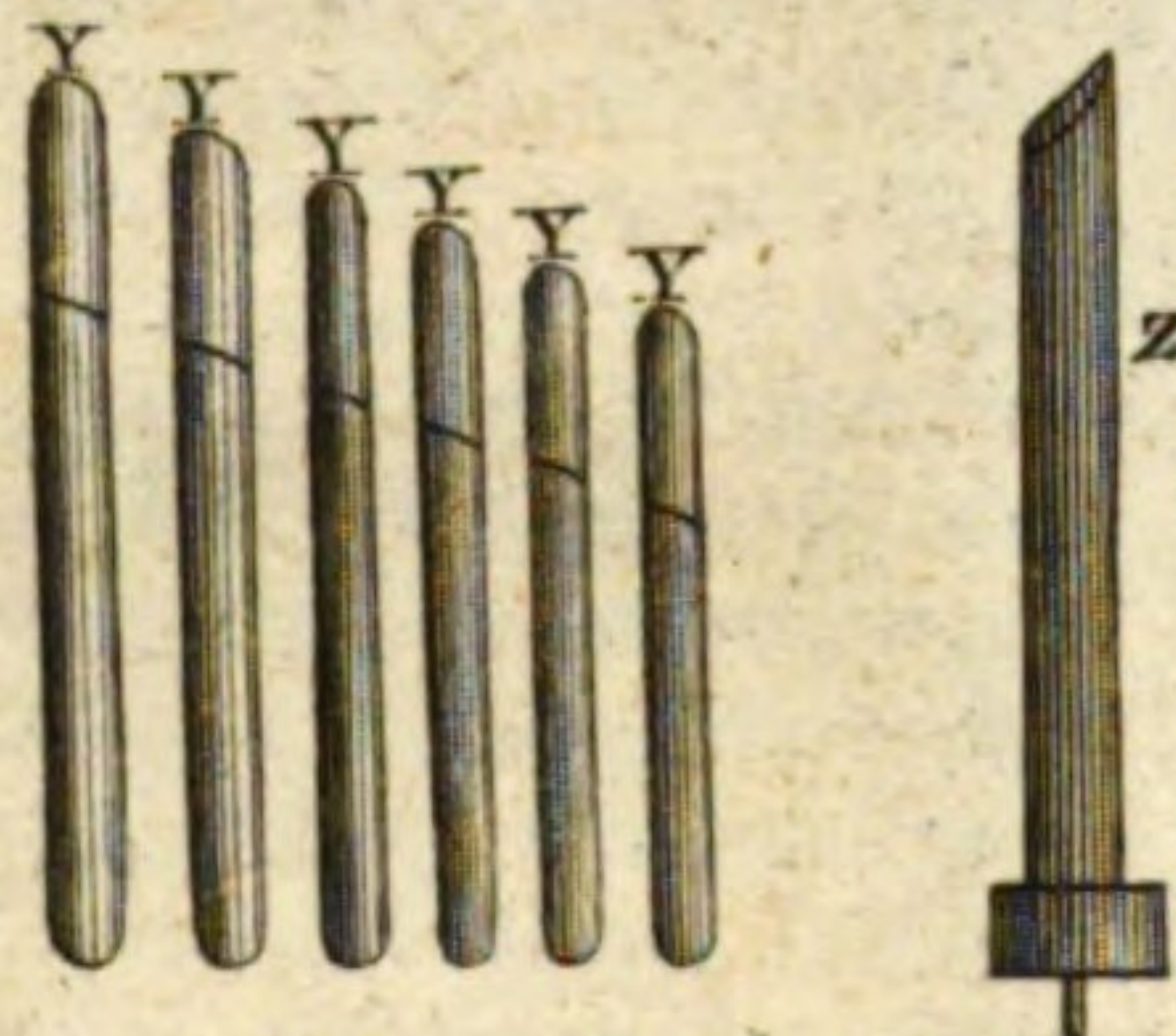
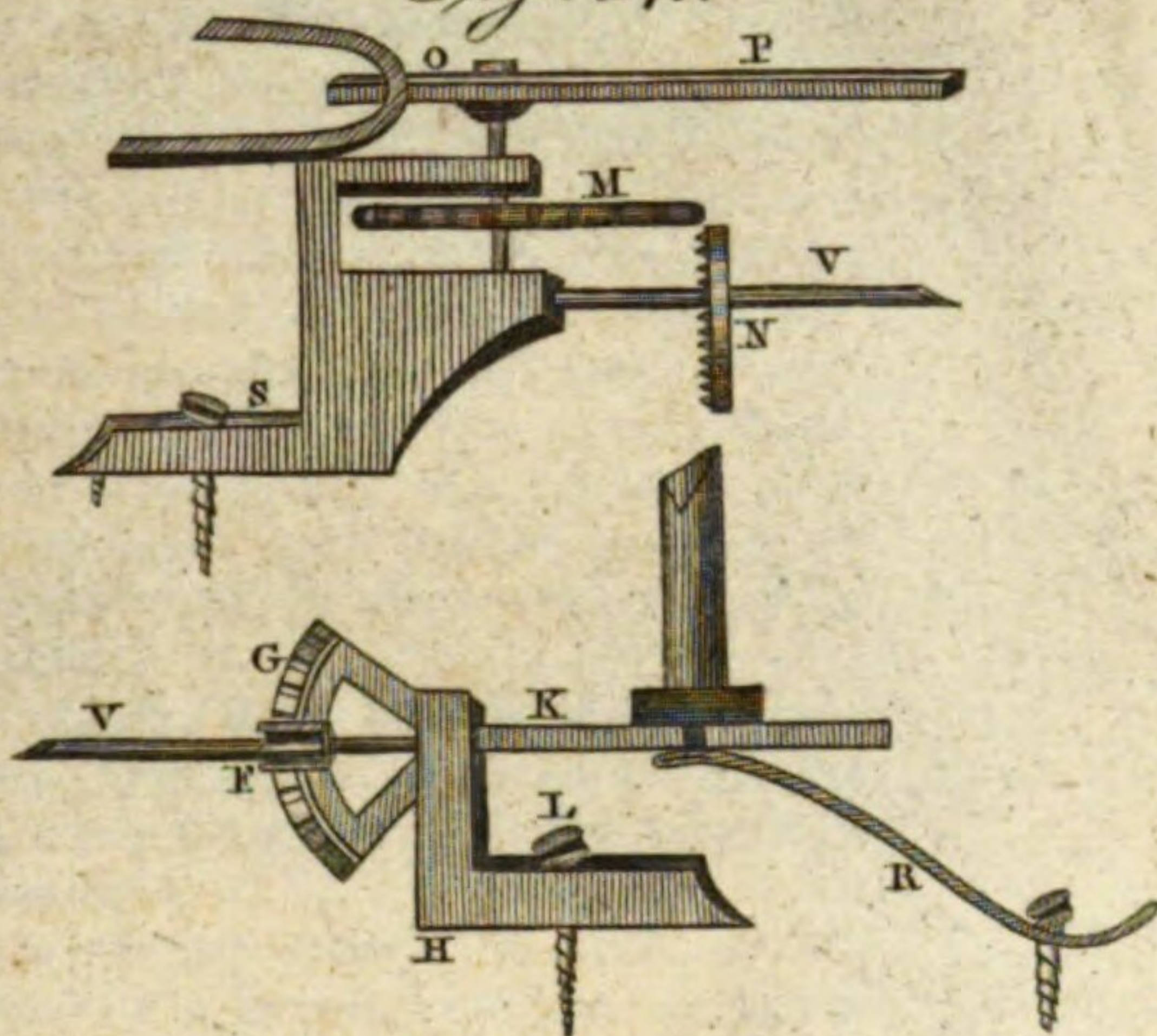


Fig. 44.

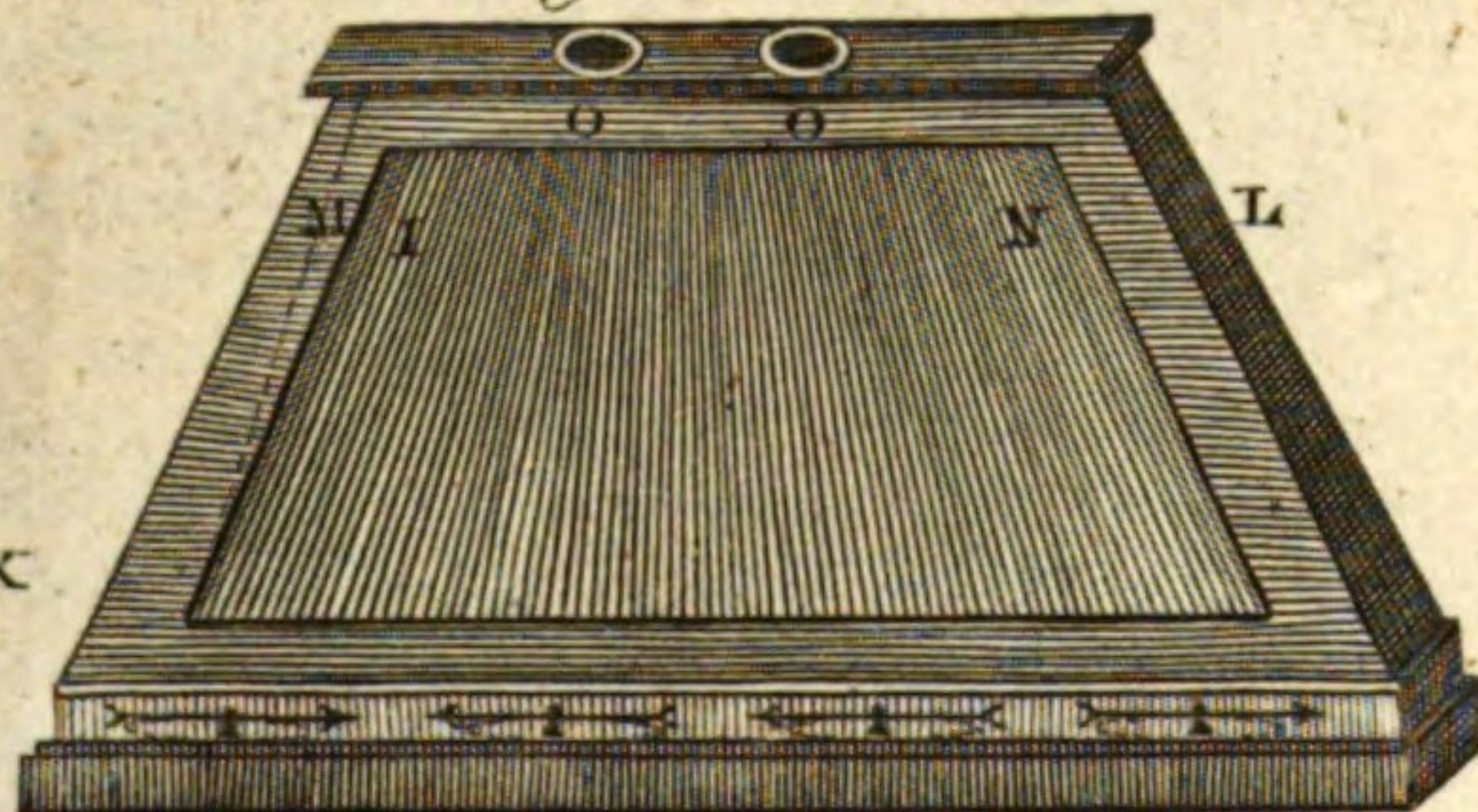
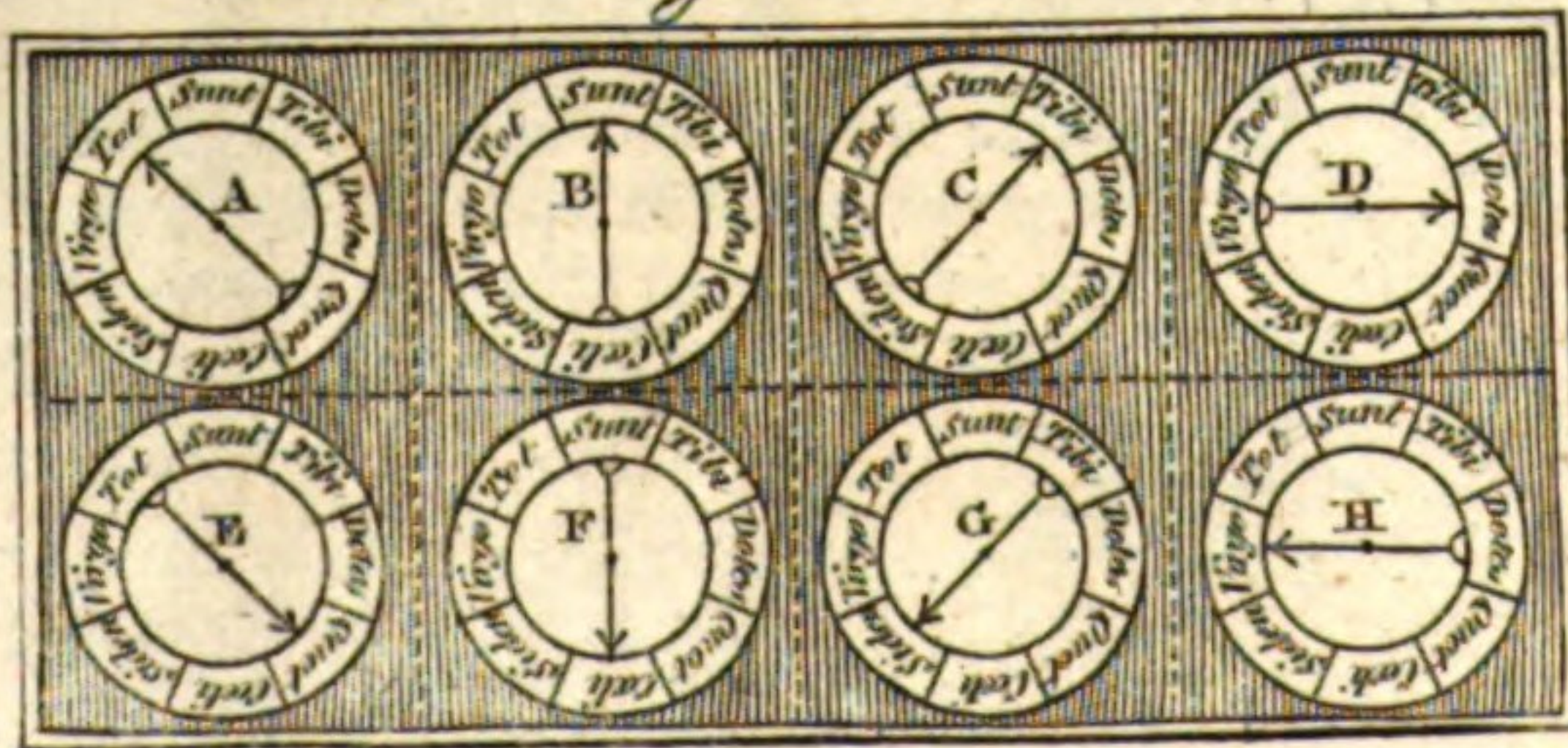


Fig. 43.



Animal
Magnetism

Animal MAGNETISM, a sympathy lately supposed by some persons to exist between the magnet and the human body; by means of which the former became capable of curing many diseases in an unknown way, something resembling the performances of the old magicians.

The fanciful system, to call it by no worse name, of animal magnetism, appears to have originated, in 1774, from a German philosopher named *Father Hehl*, who greatly recommended the use of the magnet in medicine. M. Mesmer, a physician of the same country, by adopting the principles of Hehl, became the direct founder of the system; but, afterwards deviating from the tenets of his instructor, he lost his patronage, as well as that of Dr Ingenhoufz, which he had formerly enjoyed. Mesmer had already distinguished himself by "A dissertation on the influence of the Stars upon the human body," which he publicly defended in a thesis before the university of Vienna; but he was so unable to stand before the opposition of Hehl and Ingenhoufz, that his system fell almost instantly into disrepute. Mesmer appealed to the academy of sciences at Berlin; but they rejected his principles as destitute of foundation, and unworthy of the smallest attention. He then made a tour through Germany, publishing every where the great cures he performed by means of his animal magnetism, while his enemies every where pursued him with detections of the falsehood of his assertions.

Mesmer, still undaunted by so many defeats, returned to Vienna; but meeting there with no better success than before, he retired to Paris in the beginning of the year 1778. Here he met with a very different reception. He was first patronised by the author of the *Dictionnaire des Merveilles de la Nature*; in which work a great number of his cures were published, Mesmer himself receiving likewise an ample testimony of his candour and *solid reasoning*. Our physician soon collected some patients; and in the month of April 1778 retired with them to Creteil, from whence he in a short time returned with them perfectly cured. His success was now as great as his disappointment had been before. Patients increased so rapidly that the Doctor was soon obliged to take in pupils to assist him in his operations. These pupils succeeded equally well as Mesmer himself; and so well did they take care of their own emolument, that one of them, named M. Deslon, realized upwards of L. 100,000 Sterling. In 1779 Mesmer published a memoir on the subject of Animal Magnetism, promising afterwards a complete work upon the same, which should make as great a revolution in philosophy as it had already done in medicine.

The new system now gained ground daily; and soon became so fashionable, that the jealousy of the faculty was thoroughly awakened, and an application concerning it was made to government. In consequence of this a committee was appointed to inquire into the matter, consisting partly of physicians and partly of members of the royal academy of sciences, with Dr Benjamin Franklin at their head. This was a thunderstroke to the supporters of the new doctrine.—Mesmer himself refused to have any communication with the committee; but his most celebrated pupil

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Deslon was less scrupulous, and explained the principles of his art in the following manner:

1. Animal magnetism is an universal fluid, constituting an absolute plenum in nature, and the medium of all mutual influence between the celestial bodies and betwixt the earth and animal bodies.

2. It is the most subtle fluid in nature; capable of a flux and reflux, and of receiving, propagating, and continuing all kinds of motion.

3. The animal body is subjected to the influences of this fluid by means of the nerves, which are immediately affected by it.

4. The human body has poles and other properties analogous to the magnet.

5. The action and virtue of animal magnetism may be communicated from one body to another, whether animate or inanimate.

6. It operates at a great distance without the intervention of any body.

7. It is increased and reflected by mirrors; communicated, propagated, and increased by sound; and may be accumulated, concentrated, and transported.

8. Notwithstanding the universality of this fluid, all animal bodies are not equally affected by it; on the other hand, there are some, though but few in number, the presence of which destroys all the effects of animal magnetism.

9. By means of this fluid nervous disorders are cured immediately, and others mediately; and its virtues, in short, extend to the universal cure and preservation of mankind.

From this extraordinary theory, Mesmer, or M. Deslon, had fabricated a paper, in which he stated that there was in nature but one disease and one cure, and that this cure was animal magnetism: and lastly, M. Deslon engaged, 1. To prove to the commissioners, that such a thing as animal magnetism existed; 2. To prove the utility of it in the cure of diseases; after which he was to communicate to them all that he knew upon the subject. The commissioners accordingly attended in the room where the patients underwent the magnetical operations. The apparatus consisted of a circular platform made of oak, and raised about a foot and an half from the ground; which platform was called the *baquet*. At the top of it were a number of holes, in which were iron rods with moveable joints for the purpose of applying them to any part of the body. The patients were placed in a circle round, each touching an iron rod, which he could apply to any part of the body at pleasure; they were joined to one another by a cord passing round their bodies, the design being to increase the effect by communication. In the corner of the room was a piano forte, on which some airs were played, occasionally accompanied with a song. Each of the patients held in his hand an iron rod ten or twelve feet long; the intention of which, as Deslon told the commissioners, was to concentrate the magnetism in its point, and thus to render its effects more sensible. Sound is another conductor of this magnetism; and in order to communicate the magnetism to the piano forte, nothing more is necessary than to bring the iron rod near it. Some magnetism is also furnished by the person who plays it; and this magnetism is transmitted

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ted to the patients by the sounds. The internal part of the platform was said to be so contrived as to concentrate the magnetism, and was the reservoir whence the virtue diffused itself among the patients. Its structure, however, is not mentioned; but the committee satisfied themselves, by means of a needle and electrometer, that neither common magnetism nor electricity was concerned.

Besides the different ways of receiving the magnetism already mentioned, viz. by the iron, cord, and piano forte, the patients also had it directly from the Doctor's finger, and a rod which he held in his hand, and which he carried about the face, head, or such parts of the patient as were diseased; observing always the direction of what he called the poles. The principal application of magnetism, however, was by pressure of the hands or fingers on the hypochondria or lower regions of the stomach.

The effects of these operations upon Deslon's patients were very different. Some felt nothing, neither had the magnetism any effect whatever upon them. Some spit, coughed, sweat, and felt, or pretended to feel, extraordinary heats in different parts of the body. Many women, but very few men, had convulsions, which Deslon called their crisis, &c.—The commissioners at last found that they could come to no satisfactory conclusion while they attended in this public way, and therefore determined to try the experiments themselves privately. As the fluid itself, however, was totally imperceptible by any of the senses, they could only ascertain themselves of its existence by ultimately curing diseases, or by its observable effects upon the human body. Being well assured, however, that though many diseases were cured, it would not amount to any proof of the existence of animal magnetism, they determined to observe its effects on the animal œconomy. For this purpose they made the following experiments:

1. They tried it upon themselves, and felt nothing.
2. Seven of Deslon's patients were magnetised at Dr Franklin's house, four of whom felt nothing; three felt, or affected to feel something.
3. Several persons in a higher sphere of life were magnetised, and felt nothing.
4. The commissioners, now determined to discover what share imagination had in this business, blindfolded several of the common people, and made them sometimes think that they were magnetised, at other times they magnetised them without letting them know that they did so: the consequence was, that when they supposed themselves magnetised, the patients likewise thought they felt something, and *vice versa*.
5. A magnetised tree was said to produce convulsions; a young man, blindfolded, fell into convulsions when he imagined himself near the tree, though he was really at a considerable distance from it. Deslon accounted for this on the principle of all trees being magnetic: but in this case, every one, susceptible of magnetism, would be seized with convulsions when he approached a tree. The same influence of imagination was observed in a woman accustomed to have convulsions when magnetised. They came on when

nothing was done to her, on being told, when blindfolded, that she was magnetised.

Other instances are given, from which it was evident, either that the patients were impostors, or in such a most wretched state of debility both of mind and body, that the most trifling effects of the former had the most powerful effects on the latter. The commissioners therefore entirely disapproved of the whole. The touch, imitation, and imagination, they concluded, were the great causes of the effects produced by Mr Deslon's operations; and by means of these they supposed that convulsions, which in themselves are a very violent disorder, might be spread much farther than could be wished, even through a whole city. It was observed that the operator sometimes pressed strongly, and for a length of time, upon different parts of the body, particularly the hypochondria and pit of the stomach; and it is well known that a strong pressure on these parts will produce disagreeable sensations in those who enjoy perfect health.

It is needless to add more upon this subject, than that Mesmer complained of the report of the commissioners, petitioned parliament, was by them commanded to discover the mysteries of his doctrine; and that it is now exploded by every man of sense.—The conclusion of the academicians concerning it was, that it is not entirely useless even to philosophy; as it is one *fact* more to be consigned to the history of the errors and illusions of the human mind, and a signal instance of the power of imagination.

MAGNIEZ (Nicolas), a learned and laborious ecclesiastic, who died in the year 1749 at an advanced age. He is known by his excellent Latin dictionary, intitled *Novitius*, printed at Paris 1721, 2 vols 4to. Notwithstanding the great utility of this dictionary to masters, and the merited esteem in which it is held, it has never undergone another edition; for in that which bears the date of 1733, there is no circumstance of difference except the frontispiece. In this dictionary, besides the words to be met with in the classics, we find all those which occur in the Bible, the breviary, and the ecclesiastical authors, the terms of art, the names of great men, heathen-gods, bishops, councils, heresies, &c.; in short, more than 6000 words which are not to be found in the common dictionaries.

MAGNIFYING, the making of objects appear larger than they would otherwise do; whence convex lenses, which have the power of doing this, are called *magnifying glasses*. See OPTICS.

MAGNITUDE, whatever is made up of parts locally extended, or that has several dimensions; as a line, surface, solid, &c.

MAGNOLIA, the LAUREL-LEAVED TULIP TREE, in botany: A genus of the polyginia order, belonging to the polyandria class of plants; and in the natural method ranking under the 52d order, *Coadnata*. The calyx is triphyllous; there are nine petals; the capsules bivalved and imbricated; the seeds pendulous, and in the form of a berry.

Species. 1. The glauca, or small magnolia, is a native of Virginia, Carolina, and other parts of North America. In moist places it rises from seven or eight to 15 or 16 feet high, with a slender stem. The wood

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Magnolia

Magnolia. wood is white and spongy, the bark smooth and of a greenish white colour; the branches garnished with thick smooth leaves, like those of the bay; but of an oval shape, smooth on their edges, and white underneath. The flowers are produced at the extremities of the branches, are white, composed of six concave petals, and have an agreeable scent. After the flowers are past, the fruit increases in size till it becomes as large as a walnut with its cover; but of a conical shape, having many cells round the outside, in each of which is a flat seed about the size of a small kidney-bean. When ripe, the fruit is of a brown colour, the seeds are discharged from their cells, and hang by a slender thread. 2. The *grandiflora*, or great magnolia, is a native of Florida and South Carolina. It rises to the height of 80 feet or more, with a straight trunk upwards of two feet diameter, having a regular head. The leaves resemble those of the laurel, but are larger, and continue green throughout the year. The flowers are produced at the ends of the branches, and are of a purplish white colour. 3. The *tripetala*, or umbrella-tree, is a native of Carolina. It rises, with a slender trunk, to the height of 16 or 20 feet; the wood is soft and spongy; the leaves remarkably large, and produced in horizontal circles, somewhat resembling an umbrella, from whence the inhabitants of those countries have given it this name. The flowers are composed of ten or eleven white petals, that hang down without any order. The leaves drop off at the beginning of winter. 4. The *acuminata*, with oval, spear-shaped, pointed leaves, is a native of the inland parts of North America. The leaves are near eight inches long, and five broad; ending in a point. The flowers come out early in the spring, and are composed of 12 white petals; the wood is of a fine grain, and an orange colour.

Culture, &c. All these species are propagated by seeds, which must be procured from the places where they grow naturally. They should be put up in sand, and sent over as soon as possible; for if they are kept long out of the ground, they rarely grow.—The glauca generally grows in a poor swampy soil, or on wet meadows. The English and Swedes in Pennsylvania and New Jersey call it *beaver-tree*, because the root of it is the dainty of beavers, which are caught by its means. It drops its leaves early in autumn, though some of the young trees keep them all the winter. This tree is seldom found to the north of Pennsylvania, where it begins to flower about the end of May. The scent of its blossoms is exquisite: for by it you can discover, within three quarters of an English mile, whether these little trees stand in the neighbourhood, provided the wind be not against it; for the whole air is filled with this sweet and pleasant odour. It is beyond description agreeable to travel in the woods about that time, especially towards night. They retain their flowers for three weeks, and even longer, according to the quality of the soil on which the trees stand; and during the whole time of their being in blossom, they spread their odoriferous exhalations. The berries likewise look very fine when they are ripe; for they have a rich red colour, and hang in bunches on slender stalks. The cough and other pectoral diseases are cured by putting the berries into rum or brandy, of which a draught every morning may be taken: the

virtues of this remedy were universally extolled, and even praised, for their salutary effects in consumptions. The bark being put into brandy, or boiled in any other liquor, is said not only to ease pectoral diseases, but likewise to be of some service against all internal pains and heat; and it was thought that a decoction of it could stop the dysentery. Persons who had caught cold boiled the branches of the beaver-tree in water, and drank it to their great relief. *Kalm.*

MAGNUS (John), archbishop of Upsal, was born at Lincopping in 1488. Being made apostolical nuncio, he used his utmost endeavours to prevent Gustavus Vasa from becoming king of Sweden, and the introduction of Lutheranism into his dominions; and spared no means to attain these ends. He died at Rome in 1545. He wrote a history of Sweden, and a history of the archbishops and bishops of Upsal.

MAGNUS (Olaus), archbishop of Upsal in Sweden, succeeded his brother John Magnus in 1544. He appeared with great credit at the council of Trent in 1546, and suffered much afterward for the Catholic religion. We have of his writing, *A History of the Manners, Customs, and Wars of the Northern Nations of Europe.*

MAGNUS CAMPUS, (anc. geog.), a tract lying towards Scythopolis, or Bethsan in Gallilee, beyond which it extends into Samaria; Josephus placing the common boundary between these two districts, in the Campus Magnus. Called also *Esdreton*, (Judith); 30 miles long, and 18 broad; having Samaria with mount Ephraim to the south, the lake Genesareth to the east, mount Carmel to the west, and Lebanon to the north.

MAGNUS Portus, (anc. geog.), a port of the Belgæ, in Britain, on the Channel. Now thought to be Portsmouth, in Hampshire.—Another *Portus Magnus* of Bætica in Spain; a port to the east of Abdera.

MAGO, the name of several Carthaginian generals. See CARTHAGE.

MAGO, (anc. geog.) a citadel and town of the Balearis Minor, or Minorca. Now Maon, or Mahon. E. long. 4° 6'. lat. 39° 5'.

MAGONTIACUM, MOGUNTIIACUM, or *Mogontiacus*, truncated afterwards by the poets to *Mogontia*, *Maguntia*, and *Moguntia*: a town of Gallia Belgica. Now *Mentz*, capital of the electorate of that name; situated at the confluence of the Rhine and Maine. E. long. 8°. lat. 50°.

MAGOPHONIA (formed from *μαγος*, “magus,” and *φονος*, “slaughter”), the name of a feast among the ancient Persians, held in memory of the expulsion of the Magians. The Magus Smerdis having usurped the throne of Persia, upon the death of Cambyses, 521 years before Jesus Christ, seven of the principal lords of the court conspired to drive him out of it.—Their design was executed with good success: Smerdis and his brother, another Magus, called Patizithes, were killed. Upon which the people also rose, and put all the Magi to the sword, inasmuch that there would not one have escaped, had not night come upon them. Darius, son of Hystaspes, was then elected king; and, in memory of this massacre of the Magi, a feast was instituted, says Herodotus, called *Magophonia*. See MAGI.

MAGPY, in ornithology. See CORVUS.

Mahie
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Mahomet.

MAHIE, the name given by the inhabitants of O-tahete, or George's island, to their bread-fruit when made into a kind of four paste, which, in consequence of having undergone a fermentation, will keep a considerable time, and supply them with food when no ripe fruit is to be had. When therefore they see a great shew of new fruit on the trees, they strip them all at once of their former crop, of which they make mahie. This *succedaneum* for ripe bread-fruit is thus made. They gather the fruit before it be perfectly ripe, and laying it in heaps cover it closely with leaves. In this state it ferments, and becomes disagreeably sweet; the core is then taken out entire, and the rest of the fruit thrown into a hole in their houses, dug on purpose, and neatly lined in the bottom and sides with grafs. The whole is then covered with leaves, and heavy stones are laid upon them. In this state it undergoes a second fermentation, and becomes sour; after which it will suffer no change for many months. It is taken out of this hole as it is wanted for use, and being made into balls, it is wrapped up in leaves and baked, and thus dressed it will keep for five or six weeks. It is eaten, both cold and hot, and the natives of those countries seldom make a meal without it; but to captain Cook and his company the taste was as disagreeable as that of a pickled olive generally is the first time it is eaten.

MAHO. See HIBISCUS.

MAHOGANY. See SWIETENIA.

MAHOMET, or MOHAMMED, styled the *Impostor*, was born in the reign of Anushirwan the Just, emperor of Persia, about the end of the 6th century of the Christian æra. He came into the world under some disadvantages. His father Abd'allah was a younger son of Abd'almotalleb; and dying very young, and in his father's lifetime, left his widow and infant-son in very mean circumstances, his whole substance consisting but of five camels and one Ethiopian she-slave. Abd'almotalleb was therefore obliged to take care of his grandchild Mahomet; which he not only did during his life, but at his death enjoined his eldest son Abu Taleb, who was brother to Abd'allah by the same mother, to provide for him for the future: which he very affectionately did, and instructed him in the business of a merchant, which he followed; and to that end he took him into Syria when he was but 13. He afterwards recommended him to Khadijah, a noble and rich widow, for her factor; in whose service he behaved himself so well, that by making him her husband she soon raised him to an equality with the richest in Mecca.

After he began by this advantageous match to live at his ease, it was, that he formed the scheme of establishing a new religion, or, as he expressed it, of replanting the only true and ancient one professed by Adam, Noah, Abraham, Moses, Jesus, and all the prophets, by destroying the gross idolatry into which the generality of his countrymen had fallen, and weeding out the corruptions and superstitions which the latter Jews and Christians had, as he thought, introduced into their religion, and reducing it to its original purity, which consisted chiefly in the worship of one only God.

Before he made any attempt abroad, he rightly judged that it was necessary for him to begin with the

conversion of his own household. Having therefore retired with his family, as he had done several times before, to a cave in mount Hara, he there opened the secret of his mission to his wife Khadijah; and acquainted her, that the angel Gabriel had just before appeared to him, and told him that he was appointed the apostle of God: he also repeated to her a passage which he pretended had been revealed to him by the ministry of the angel, with those other circumstances of this first appearance, which are related by the Mahometan writers. Khadijah received the news with great joy; swearing by him in whose hands her soul was, that she trusted he would be the prophet of his nation; and immediately communicated what she had heard to her cousin Warakah Ebn Nawfal, who, being a Christian, could write in the Hebrew character, and was tolerably well versed in the scriptures; and he as readily came into her opinion, assuring her that the same angel who had formerly appeared unto Moses was now sent to Mahomet. The first overture the prophet made was in the month of Ramadan, in the 40th year of his age, which is therefore usually called the year of his mission.

Encouraged by so good a beginning, he resolved to proceed, and try for some time what he could do by private persuasion, not daring to hazard the whole affair by exposing it too suddenly to the public. He soon made profelytes of those under his own roof, viz. his wife Khadijah, his servant Zeid Ebn Haretha, to whom he gave his freedom on that occasion, (which afterwards became a rule to his followers), and his cousin and pupil Ali, the son of Abu Taleb, though then very young: but this last, making no account of the other two, used to style himself the *first of believers*. The next person Mahomet applied to was Abd'allah Ebn Abi Kohafa, surnamed *Abu Becr*, a man of great authority among the Koreish, and one whose interest he well knew would be of great service to him; as it soon appeared: for Abu Becr, being gained over, prevailed also on Othman Ebn Affan, Abd'alraham Ebn Awf, Saad Ebn Abbi Wakkas, al Zobeir Ebn al Awam, and Telha Ebn Obeid'allah, all principal men of Mecca, to follow his example. These men were the six chief companions, who, with a few more, were converted in the space of three years: at the end of which, Mahomet having, as he hoped, a sufficient interest to support him, made his mission no longer a secret, but gave out that God had commanded him to admonish his near relations; and in order to do it with more convenience and prospect of success, he directed Ali to prepare an entertainment, and invite the sons and descendants of Abd'almotalleb, intending then to open his mind to them. This was done, and about 40 of them came; but Abu Laheb, one of his uncles, making the company break up before Mahomet had an opportunity of speaking, obliged him to give them a second invitation the next day; and when they were come, he made them the following speech: "I know no man in all Arabia who can offer his kindred a more excellent thing than I now do you: I offer you happiness both in this life, and in that which is to come; God Almighty hath commanded me to call you unto him: Who, therefore, among you will be assistant to me herein, and become my brother and my vicegerent?" All of them hesitating, and declining the matter, Ali

Mahomet. at length rose up, and declared that he would be his assistant; and vehemently threatened those who should oppose him. Mahomet upon this embraced Ali with great demonstrations of affection, and desired all who were present to hearken to and obey him as his deputy; at which the company broke out into a great laughter, telling Abu Taleb that he must now pay obedience to his son.

This repulse, however, was so far from discouraging Mahomet, that he began to preach in public to the people; who heard him with some patience till he came to upbraid them with the idolatry, obstinacy, and perverseness of themselves and their fathers: which so highly provoked them, that they declared themselves his enemies; and would soon have procured his ruin, had he not been protected by Abu Taleb. The chief of the Koreish warmly solicited this person to desert his nephew, making frequent remonstrances against the innovations he was attempting; which proving ineffectual, they at length threatened him with an open rupture, if he did not prevail on Mahomet to desist. At this Abu Taleb was so far moved, that he earnestly dissuaded his nephew from pursuing the affair any farther, representing the great danger he and his friends must otherwise run. But Mahomet was not to be intimidated; telling his uncle plainly, *that if they set the sun against him on his right hand, and the moon on his left, he would not leave his enterprize*: and Abu Taleb, seeing him so firmly resolved to proceed, used no further arguments, but promised to stand by him against all his enemies.

The Koreish, finding they could prevail neither by fair words or menaces, tried what they could do by force and ill-treatment; using Mahomet's followers so very injuriously, that it was not safe for them to continue at Mecca any longer: whereupon Mahomet gave leave to such of them as had not friends to protect them to seek for refuge elsewhere. And accordingly in the fifth year of the prophet's mission, 16 of them, four of whom were women, fled into Ethiopia; and among them Othman Ebn Affan and his wife Rakiah, Mahomet's daughter. This was the first flight; but afterwards several others followed them, retiring one after another, to the number of 83 men and 18 women, besides children. These refugees were kindly received by the Najashi, or king of Ethiopia; who refused to deliver them up to those whom the Koreish sent to demand them, and, as the Arab writer unanimously attest, even professed the Mahometan religion.

In the sixth year of his mission, Mahomet had the pleasure of seeing his party strengthened by the conversion of his uncle Hamza, a man of great valour and merit; and of Omar Ebn al Kattab, a person highly esteemed, and once a violent opposer of the prophet. As persecution generally advances rather than obstructs the spreading of a religion, Islamism made so great a progress among the Arab tribes, that the Koreish, to suppress it effectually if possible, in the seventh year of Mahomet's mission, made a solemn league or covenant against the Hashemites and the family of Abd'almotaleb, engaging themselves to contract no marriages with any of them, and to have no communication with them; and, to give it the greater sanction, reduced it into writing, and laid it up in the Caaba. Upon this

the tribe became divided into two factions; and the family of Hashem all repaired to Abu Taleb, as their head; except only Abd'al Uzza, surnamed *Abu Labeb*, who, out of inveterate hatred to his nephew and his doctrine, went over to the opposite party, whose chief was Abu Sofian Ebn Harb, of the family of Ommeya.

The families continued thus at variance for three years; but in the tenth year of his mission, Mahomet told his uncle Abu Taleb, that God had manifestly showed his disapprobation of the league which the Koreish had made against them, by sending a worm to eat out every word of the instrument except the name of *God*. Of this accident Mahomet had probably some private notice: for Abu Taleb went immediately to the Koreish, and acquainted them with it; offering, if it proved false, to deliver his nephew up to them; but in case it were true, he insisted that they ought to lay aside their animosity, and annul the league they had made against the Hashemites. To this they acquiesced; and going to inspect the writing, to their great astonishment found it to be as Abu Taleb had said; and the league was thereupon declared void.

In the same year Abu Taleb died, at the age of above fourscore; and it is the general opinion that he died an infidel: though others say, that when he was at the point of death he embraced Mahometanism; and produce some passages out of his poetical compositions to confirm their assertion. About a month, or, as some write, three days after the death of this great benefactor and patron, Mahomet had the additional mortification to lose his wife Khadijah, who had so generously made his fortune. For which reason this year is called the *year of mourning*.

On the death of these two persons, the Koreish began to be more troublesome than ever to their prophet, and especially some who had formerly been his intimate friends; insomuch that he found himself obliged to seek for shelter elsewhere, and first pitched upon Tayef, about 60 miles east from Mecca, for the place of his retreat. Thither therefore he went, accompanied by his servant Zied, and applied himself to two of the chief of the tribe of Thakif who were the inhabitants of that place; but they received him very coldly. However, he staid there a month; and some of the more considerate and better sort of men treated him with a little respect: but the slaves and inferior people at length rose against him; and bringing him to the wall of the city, obliged him to depart and return to Mecca, where he put himself under the protection of Al Motaam Ebn Adi.

This repulse greatly discouraged his followers. However, Mahomet was not wanting to himself; but boldly continued to preach to the public assemblies at the pilgrimage, and gained several proselytes; and among them six of the inhabitants of Yathreb of the Jewish tribe of Khazraj; who, on their return home, failed not to speak much in commendation of their new religion, and exhorted their fellow-citizens to embrace the same.

In the 12th year of his mission it was that Mahomet gave out that he had made his night-journey from Mecca to Jerusalem, and thence to heaven, so much spoken of by all that write of him. Dr Prideaux thinks he invented it, either to answer the expectations of

Mahomet. of those who demanded some miracle as a proof of his mission; or else, by pretending to have conversed with God, to establish the authority of whatever he should think fit to leave behind by way of oral tradition, and make his sayings to serve the same purpose as the oral law of the Jews. But it does not appear that Mahomet himself ever expected so great a regard should be paid to his sayings, as his followers have since done; and seeing he all along disclaimed any power of performing miracles, it seems rather to have been a fetch of policy to raise his reputation, by pretending to have actually conversed with God in heaven, as Moses had heretofore done in the mount, and to have received several institutions immediately from him, whereas before he contented himself with persuading them that he had all by the ministry of Gabriel.

However, this story seemed so absurd and incredible, that several of his followers left him upon it; and had probably ruined the whole design, had not Abu Becr vouched for his veracity, and declared, that, if Mahomet affirmed it to be true, he verily believed the whole. Which happy incident not only retrieved the prophet's credit, but increased it to such a degree, that he was secure of being able to make his disciples swallow whatever he pleased to impose on them for the future. And this fiction, notwithstanding its extravagance, was one of the most artful contrivances Mahomet ever put in practice, and what chiefly contributed to the raising of his reputation to that great height to which it afterwards arrived.

In this year, called by the Mahometans the *accepted year*, 12 men of Yathreb or Medina, of whom 10 were of the tribe of Khazraj, and the other two of that of Aws, came to Mecca, and took an oath of fidelity to Mahomet at al Akaba, a hill on the north of that city. This oath was called the *womens oath*; not that any women were present at this time, but because a man was not thereby obliged to take up arms in defence of Mahomet or his religion; it being the same oath that was afterwards exacted of the women, the form of which we have in the Koran, and is to this effect: *viz.* That they should renounce all idolatry; and they should not steal, nor commit fornication, nor kill their children (as the Pagan Arabs used to do when they apprehended they should not be able to maintain them), nor forge calumnies; and that they should obey the prophet in all things that were reasonable. When they had solemnly engaged to all this, Mahomet sent one of his disciples, named *Masab Ebn Omair*, home with them, to instruct them more fully in the grounds and ceremonies of his new religion.

Masab being arrived at Medina, by the assistance of those who had been formerly converted, gained several proselytes, particularly *Osaid Ebn Hodeira*, a chief man of the city, and *Saad Ebn Moadh*, prince of the tribe of Aws; Mahometanism spreading so fast, that there was scarce a house wherein there were not some who had embraced it.

The next year, being the 13th of Mahomet's mission, Masab returned to Mecca, accompanied by 73 men and two women of Medina who had professed Islamism, besides some others who were as yet unbelievers. On their arrival, they immediately sent to Mahomet, and offered him their assistance, of which he was now

in great need; for his adversaries were by this time Mahomet, grown so powerful in Mecca, that he could not stay there much longer without imminent danger. Wherefore he accepted their proposal, and met them one night, by appointment, at al Akaba above mentioned, attended by his uncle al Abbas; who, though he was not then a believer, wished his nephew well, and made a speech to those of Medina; wherein he told them, that as Mahomet was obliged to quit his native city, and seek an asylum elsewhere, and they had offered him their protection, they would do well not to deceive him; that if they were not firmly resolved to defend, and not betray him, they had better declare their minds, and let him provide for his safety in some other manner. Upon their protesting their sincerity, Mahomet swore to be faithful to them, on condition that they should protect him against all insults as heartily as they would their own wives and families. They then asked him what recompence they were to expect if they should happen to be killed in his quarrel; he answered, Paradise. Whereupon they pledged their faith to him, and so returned home; after Mahomet had chosen 12 out of their number, who were to have the same authority among them as the 12 apostles of Christ had among his disciples.

Hitherto Mahomet had propagated his religion by fair means; so that the whole success of his enterprise, before his flight to Medina, must be attributed to persuasion only, and not to compulsion. For before this second oath of fealty or inauguration at al Akaba, he had no permission to use any force at all; and in several places of the Koran, which he pretended were revealed during his stay at Mecca, he declares his business was only to preach and admonish; that he had no authority to compel any person to embrace his religion; and that, whether people believe or not, was none of his concern, but belonged solely unto God. And he was so far from allowing his followers to use force, that he exhorted them to bear patiently those injuries which were offered them on account of their faith; and, when persecuted himself, chose rather to quit the place of his birth and retire to Medina, than to make any resistance. But this great passiveness and moderation seem entirely owing to his want of power, and the great superiority of his opposers for the first 12 years of his mission; for no sooner was he enabled, by the assistance of those of Medina, to make head against his enemies, than he gave out, that God had allowed him and his followers to defend themselves against the infidels; and at length, as his forces increased, he pretended to have the divine leave even to attack them; and to destroy idolatry, and set up the true faith by the sword; finding, by experience, that his designs would otherwise proceed very slowly, if they were not utterly overthrown; and knowing, on the other hand, that innovators, when they depend solely on their own strength, and can compel, seldom run any risk; from whence, says Machiavel, it follows, that all the armed prophets have succeeded, and the unarmed ones have failed. Moses, Cyrus, Theseus, and Romulus, would not have been able to establish the observance of their institutions for any length of time, had they not been armed. The first passage of the Koran which gave Mahomet the permission of defend-
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Mahomet. ing himself by arms, is said to have been that in the 22d chapter; after which a great number to the same purpose were revealed.

That Mahomet had a right to take up arms for his own defence against his unjust persecutors, may perhaps be allowed; but whether he ought afterwards to have made use of that means for the establishing of his religion, it is not so easy to determine. How far the secular power may or ought to interpose in affairs of this nature, mankind are not agreed. The method of converting by the sword gives no very favourable idea of the faith which is so propagated, and is disallowed by every body in those of another religion, though the same persons are willing to admit of it for the advancement of their own; supposing that, though a false religion ought not to be established by authority, yet a true one may; and accordingly force is almost as constantly employed in these cases by those who have the power in their hands, as it is constantly complained of by those who suffer the violence. It is certainly one of the most convincing proofs that Mahometanism was no other than a human invention, that it owed its progress and establishment almost entirely to the sword; and it is one of the strongest demonstrations of the divine original of Christianity, that it prevailed against all the force and powers of the world by the mere dint of its own truth, after having stood the assaults of all manner of persecutions, as well as other oppositions, for 300 years together, and at length made the Roman emperors themselves submit thereto; after which time, indeed, this proof seems to fail, Christianity being then established, and Paganism abolished, by public authority, which has had great influence in the propagation of the one and destruction of the other ever since. But to return.

Mahomet, having provided for the security of his companions as well as his own, by the league offensive and defensive which he had now concluded with those of Medina, directed them to repair thither, which they accordingly did; but himself with Abu Becr and Ali staid behind, having not yet received the divine permission, as he pretended, to leave Mecca. The Koreish fearing the consequence of this new alliance, began to think it absolutely necessary to prevent Mahomet's escape to Medina; and having held a council thereon, after several milder expedients had been rejected, they came to a resolution that he should be killed; and agreed that a man should be chosen out of every tribe for the execution of this design; and that each man should have a blow at him with his sword; that the guilt of his blood might fall equally on all the tribes, to whose united power the Hashemites were much inferior, and therefore durst not attempt to revenge their kinsman's death.

This conspiracy was scarce formed, when, by some means or other, it came to Mahomet's knowledge; and he gave out that it was revealed to him by the angel Gabriel, who had now ordered him to retire to Medina. Whereupon, to amuse his enemies, he directed Ali to lie down in his place, and wrap himself up in his green cloak, which he did; and Mahomet escaped miraculously, as they pretend, to Abu Becr's house, unperceived by the conspirators, who had already assembled at the prophet's door. They, in the mean time, looking through the crevice, and seeing Ali,

whom they took to be Mahomet himself, asleep, continued watching there till morning, when Ali awoke, and they found themselves deceived.

From Abu Becr's house Mahomet and he went to a cave in mount Thur, to the south-east of Mecca, accompanied only by Amer Ebn Foheirah, Abu Becr's servant, and Abd'allah Ebn Oreitah, an idolater whom they had hired for a guide. In this cave they lay hid three days, to avoid the search of their enemies; which they very narrowly escaped, and not without the assistance of more miracles than one: for some say that the Koreish were struck with blindness, so that they could not find the cave; others, that after Mahomet and his companions were got in, two pigeons laid their eggs at the entrance, and a spider covered the mouth of the cave with her web, which made them look no farther. Abu Becr, seeing the prophet in such imminent danger, became very sorrowful; whereupon Mahomet comforted him with these words, recorded in the Koran, *Be not grieved, for God is with us.* Their enemies being retired, they left the cave, and set out for Medina, by a by-road; and having fortunately, or, as the Mahometans tell us, miraculously escaped some who were sent to pursue them, arrived safely at that city; whither Ali followed them in three days, after he had settled some affairs at Mecca.

The first thing Mahomet did after his arrival at Medina, was to build a temple for his religious worship, and a house for himself, which he did on a parcel of ground which had before served to put camels in, or, as others tell us, for a burying-ground, and belonged to Sahal and Soheil the sons of Amru, who were orphans. This action Dr Prideaux exclaims against, representing it as a flagrant instance of injustice; for that, says he, he violently dispossessed these poor orphans, the sons of an inferior artificer (whom the author he quotes calls a *carpenter*), of this ground, and so founded the first fabric of his worship with the like wickedness as he did his religion. But, to say nothing of the improbability that Mahomet should act in so impolitic a manner at his first coming, the Mahometan writers set this affair in a quite different light: one tells us that he treated with the lads about the price of the ground, but they desired he would accept it as a present: however, as historians of good credit assure us, he actually bought it; and the money was paid by Abu Becr. Besides, had Mahomet accepted it as a present, the orphans were in circumstances sufficient to have afforded it: for they were of a very good family, of the tribe of Najjer, one of the most illustrious among the Arabs; and not the sons of a carpenter, as Dr Prideaux's author writes, who took the word *Najjer*, which signifies "a carpenter," for an appellative, whereas it is a proper name.

Mahomet, being securely settled at Medina, and able not only to defend himself against the insults of his enemies, but to attack them, began to send out small parties to make reprisals on the Koreish; the first party consisting of no more than nine men, who intercepted and plundered a caravan belonging to that tribe, and in the action took two prisoners. But what established his affairs very much, and was the foundation on which he built all his succeeding greatness,

Mahomet. was the gaining of the battle of Bedr, which was fought in the second year of the Hegira, and is so famous in the Mahometan history. Some reckon no less than 27 expeditions wherein Mahomet was personally present, in nine of which he gave battle, besides several other expeditions in which he was not present. His forces he maintained partly by the contributions of his followers for this purpose, which he called by the name of *zatat* or *alms*, and the paying of which he very artfully made one main article of his religion; and partly by ordering a fifth part of the plunder to be brought into the public treasury for that purpose, in which matter he likewise pretended to act by the divine direction.

In a few years, by the success of his arms (notwithstanding he sometimes came off by the worst) he considerably raised his credit and power. In the sixth year of the Hegira he set out with 1400 men to visit the temple of Mecca, not with any intent of committing hostilities, but in a peaceable manner. However, when he came to al Hodeibiya, which is situated partly within and partly without the sacred territory, the Koreish sent to let him know that they would not permit him to enter Mecca, unless he forced his way; whereupon he called his troops about him, and they all took a solemn oath of fealty or homage to him, and he resolved to attack the city; but those of Mecca sending Arwa Ebn Masud, prince of the tribe of Thakif, as their ambassador, to desire peace, a truce was concluded between them for ten years, by which any person was allowed to enter into league either with Mahomet, or with the Koreish, as he thought fit.

It may not be improper, in order to show the inconceivable veneration and respect the Mahometans by this time had for their prophet, to mention the account which the above-mentioned ambassador gave the Koreish, at his return, of their behaviour. He said he had been at the courts both of the Roman emperor and of the king of Persia, and never saw any prince so highly respected by his subjects as Mahomet was by his companions: for, whenever he made the ablution, in order to say his prayers, they ran and caught the water that he had used; and, whenever he spit, they immediately licked it up, and gathered every hair that fell from him with great superstition.

In the seventh year of the Hegira, Mahomet began to think of propagating his religion beyond the bounds of Arabia; and sent messengers to the neighbouring princes, with letters to invite them to Mahometism. Nor was this project without some success. Khosru Parviz, then king of Persia, received his letter with great disdain, and tore it in a passion, sending away the messenger very abruptly; which when Mahomet heard, he said *God shall tear his kingdom*. And soon after a messenger came to Mahomet from Badhan king of Yaman, who was a dependent on the Persians, to acquaint him that he had received orders to send him to Khosru. Mahomet put off his answer till the next morning, and then told the messenger it had been revealed to him that night that Khosru was slain by his son Shiruyeh; adding, that he was well assured his new religion and empire should rise to as great a height as that of Khosru; and therefore bid

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him advise his master to embrace Mahometism. The messenger being returned, Badhan in a few days received a letter from Shiruyeh, informing him of his father's death, and ordering him to give the prophet no further disturbance. Whereupon Badhan and the Persians with him turned Mahometans.

The emperor Heraclius, as the Arabian historians assure us, received Mahomet's letter with great respect, laying it on his pillow, and dismissed the bearer honourably. And some pretend that he would have professed this new faith, had he not been afraid of losing his crown.

Mahomet wrote to the same effect to the king of Ethiopia, though he had been converted before, according to the Arab writers; and to Mokawkas, governor of Egypt, who gave the messenger a very favourable reception, and sent several valuable presents to Mahomet, and among the rest two girls, one of which, named Mary, became a great favourite with him. He also sent letters of the like purport to several Arab princes: particularly one to al Hareth Ebn Abi Shamer king of Ghassan, who returning for answer that he would go to Mahomet himself, the prophet said, *May his kingdom perish*: another to Hawdha Ebn Ali, king of Yamama, who was a Christian, and, having some time before professed Islamism, had lately returned to his former faith; this prince sent back a very rough answer, upon which Mahomet cursing him, he died soon after: and a third to al Mondar Ebn Sawa, king of Bahrein, who embraced Mahometism, and all the Arabs of that country followed his example.

The eighth year of the Hegira was a very fortunate year to Mahomet. In the beginning of it, Khalid Ebn al Walid and Amru Ebn al As, both excellent soldiers, the first of whom afterwards conquered Syria and other countries, and the latter Egypt, became proselytes to Mahometism. And soon after the prophet sent 3000 men against the Grecian forces, to revenge the death of one of his ambassadors, who, being sent to the governor of Bosra on the same errand as those who went to the abovementioned princes, were slain by an Arab, of the tribe of Ghassan, at Muta, a town in the territory of Balka in Syria, about three days journey eastward from Jerusalem, near which town they encountered. The Grecians being vastly superior in number (for, including the auxiliary Arabs, they had an army of 100,000 men), the Mahometans were repulsed in the first attack, and lost successively three of their generals, viz. Zeid Ebn Haretha Mahomet's freedman, Jaafar the son of Abu Taleb, and Abdallah Ebn Rawaha: but Khaleb Ebn al Walid succeeding to the command, overthrew the Greeks with a great slaughter, and brought away abundance of rich spoil; on occasion of which action Mahomet gave him the title of *Seif min sayuf Allah*, "one of the swords of God."

In this year also Mahomet took the city of Mecca, the inhabitants whereof had broken the truce concluded on two years before. For the tribe of Beér, who were confederates with the Koreish, attacking those of Khozaah, who were allies of Mahomet, killed several of them, being supported in the action by a party of the Koreish themselves. The consequence

Mahomet. of this violation was soon apprehended; and Abu Sofian himself made a journey to Medina on purpose to heal the breach and renew the truce: but in vain; for Mahomet, glad of this opportunity, refused to see him: whereupon he applied to Abu Becr and Ali; but they giving him no answer, he was obliged to return to Mecca as he came.

Mahomet immediately gave orders for preparations to be made, that he might surprize the Meccans while they were unprovided to receive him: in a little time he began his march thither; and by that time he came near the city, his forces were encreased to 10,000 men. Those of Mecca, being not in a condition to defend themselves against so formidable an army, surrendered at discretion; and Abu Sofian saved his life by turning Mahometan. About 28 of the idolaters were killed by a party under the command of Khaled; but this happened contrary to Mahomet's orders, who, when he entered the town, pardoned all the Koreish on their submission, except only six men and four women, who were more obnoxious than ordinary (some of them having apostatized), and were solemnly proscribed by the prophet himself; but of these no more than three men and one woman were put to death, the rest obtaining pardon on their embracing Mahometism, and one of the women making her escape.

The remainder of this year Mahomet employed in destroying the idols in and round Mecca, sending several of his generals on expeditions for that purpose, and to invite the Arabs to Islamism: wherein it is no wonder if they now met with success.

The next year, being the ninth of the Hegira, the Mahometans call *the year of embassies*: for the Arabs had been hitherto expecting the issue of the war between Mahomet and the Koreish: but, so soon as that tribe, the principal of the whole nation, and the genuine descendants of Ishmael, whose prerogatives none offered to dispute, had submitted, they were satisfied that it was not in their power to oppose Mahomet; and therefore began to come in to him in great numbers, and to send embassies to make their submissions to him, both to Mecca, while he staid there, and also to Medina, whither he returned this year. Among the rest, five kings of the tribe of Hamyar professed Mahometism, and sent ambassadors to notify the same.

In the 10th year, Ali was sent into Yaman to propagate the Mahometan faith there; and, as it is said, converted the whole tribe of Hamdan in one day. Their example was quickly followed by all the inhabitants of that province, except only those of Najran, who, being Christians, chose rather to pay tribute.

Thus was Mahometism established, and idolatry rooted out, even in Mahomet's lifetime (for he died the next year), throughout all Arabia, except only Yamama, where Moseilama, who set up also for a prophet as Mahomet's competitor, had a great party, and was not reduced till the kalifat of Abu Becr: and the Arabs being then united in one faith, and under one prince, found themselves in a condition of making those conquests which extended the Mahometan faith over so great a part of the world.

MAHOMET, the name of several emperors of the Turks; of whom the most celebrated is,

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MAHOMET II. surnamed *the Great*, their seventh Mahomet sultan. See **TURKEY**.

He was born at Adrianople the 24th of March 1430; and is to be remembered chiefly by us for taking Constantinople in 1453, and thereby driving many learned Greeks into the West, which was a great cause of the restoration of learning in Europe, as the Greek literature was then introduced here. He was one of the greatest men upon record, with regard to the qualities necessary to a conqueror: for he conquered two empires, twelve kingdoms, and two hundred considerable cities. He was very ambitious of the title of Great, and the Turks gave it him; even the Christians have not disputed it with him; for he was the first of the Ottoman emperors whom the Western nations dignified with the title of Grand Seignior or Great Turk, which posterity has preserved to his descendants. Italy had suffered greater calamities, but she had never felt a terror equal to that which this sultan's victories imprinted. The inhabitants seemed already condemned to wear the turban: it is certain, that pope Sixtus IV. represented to himself Rome as already involved in the dreadful fate of Constantinople; and thought of nothing but escaping into Provence, and once more transferring the holy see to Avignon. Accordingly, the news of Mahomet's death, which happened the 3d of May 1481, was received at Rome with the greatest joy that ever was beheld there. Sixtus caused all the churches to be thrown open, made the tradespeople leave off their work, ordered a feast of three days, with public prayers and processions, commanded a discharge of the whole artillery of the castle of St Angelo all that time, and put a stop to his journey to Avignon.

He appears to be the first sultan who was a lover of arts and sciences; and even cultivated polite letters. He often read the History of Augustus, and the other Cæsars; and he perused those of Alexander, Constantine, and Theodosius, with more than ordinary pleasure, because these had reigned in the same country with himself. He was fond of painting, music, and sculpture; and he applied himself to the study of agriculture. He was much addicted to astrology; and used to encourage his troops by giving out, that the motion and influence of the heavenly bodies promised him the empire of the world. Contrary to the genius of his country, he delighted so much in the knowledge of foreign languages, that he not only spoke the Arabian, to which the Turkish laws, and the religion of their legislator Mahomet, are appropriated, but also the Persian, the Greek, and the French, that is, the corrupted Italian. Landin, a knight of Rhodes, collected several letters which this sultan wrote in the Syriac, Greek, and Turkish languages, and translated them into Latin. Where the originals are, nobody knows; but the translation has been published several times; as at Lyons 1520, in 4to; at Basil 1554, 12mo; in a collection published by Oporinus, at Marburg 1604, in 8vo; and at Leipzig 1690, in 12mo. Melchior Junius, professor of eloquence at Strasburg, published at Montbeliard, 1595, a collection of letters, in which there are three written by Mahomet II. to Scanderbeg. One cannot discover the least air of Turkish ferocity in these letters: they are written in as civil terms, and as obliging a manner,

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ner, as the most polite prince in Christendom could have written.

MAHOMETANISM, or MAHOMETISM, the system of religion broached by Mahomet, and still adhered to by his followers. See MAHOMET, and AL-CORAN.

Mahometanism is professed by the Turks, Persians, and several nations among the Africans, and many among the East-Indians.

The Mahometans divide their religion into two general parts, faith and practice: of which the first is divided into six distinct branches; Belief in God, in his angels, in his scriptures, in his prophets, in the resurrection and final judgment, and in God's absolute decrees. The points relating to practice are, Prayer, with washings, &c. alms, fasting, pilgrimage to Mecca, and circumcision.

I. Of the Mahometan Faith.] 1. That both Mahomet, and those among his followers who are reckoned orthodox, had and continue to have just and true notions of God and his attributes, appears so plain from the Koran itself, and all the Mahometan divines, that it would be loss of time to refute those who suppose the God of Mahomet to be different from the true God, and only a fictitious deity or idol of his own creation.

2. The existence of angels, and their purity, are absolutely required to be believed in the Koran; and he is reckoned an infidel who denies there are such beings, or hates any of them, or asserts any distinction of sexes among them. They believe them to have pure and subtle bodies, created of fire; that they neither eat nor drink, nor propagate their species; that they have various forms and offices, some adoring God in different postures, others singing praises to him, or interceding for mankind. They hold, that some of them are employed in writing down the actions of men; others in carrying the throne of God, and other services.

The four angels, whom they look on as more eminently in God's favour, and often mention on account of the offices assigned them, are, Gabriel, to whom they give several titles, particularly those of the *holy spirit*, and the *angel of revelations*, supposing him to be honoured by God with a greater confidence than any other, and to be employed in writing down the divine decrees; Michael, the friend and protector of the Jews; Azrael, the *angel of death*, who separates mens souls from their bodies; and Israfil, whose office it will be to found the trumpet at the resurrection. The Mahometans also believe, that two guardian angels attend on every man, to observe and write down his actions, being changed every day, and therefore called *al Moakkibat*, or "the angels who continually succeed one another."

The devil, whom Mahomet names *Eblis*, from his *despair*, was once one of those angels who are nearest to God's presence, called *Azazel*; and fell, according to the doctrine of the Koran, for refusing to pay homage to Adam at the command of God.

Besides angels and devils, the Mahometans are taught by the Koran to believe an intermediate order of creatures, which they call *jin* or *genii*, created also of fire, but of a grosser fabric than angels, since they eat and drink, and propagate their species, and are

subject to death. Some of these are supposed to be good and others bad, and capable of future salvation or damnation, as men are; whence Mahomet pretended to be sent for the conversion of genii as well as men.

3. As to the scriptures, the Mahometans are taught by the Koran, that God, in divers ages of the world, gave revelations of his will in writing to several prophets, the whole and every one of which it is absolutely necessary for a good Moslem to believe. The number of these sacred books were, according to them, 104. Of which 10 were given to Adam, 50 to Seth, 30 to Edris or Enoch, 10 to Abraham; and the other four, being the Pentateuch, the Psalms, the Gospel, and the Koran, were successively delivered to Moses, David, Jesus, and Mahomet; which last being the seal of the prophets, those revelations are now closed, and no more are to be expected. All these divine books, except the four last, they agree to be now entirely lost, and their contents unknown; though the Sabians have several books which they attribute to some of the antediluvian prophets. And of those four, the Pentateuch, Psalms, and Gospel, they say, have undergone so many alterations and corruptions, that, though there may possibly be some part of the true word of God therein, yet no credit is to be given to the present copies in the hands of the Jews and Christians. The Mahometans have also a gospel in Arabic, attributed to St Barnabas; wherein the history of Jesus Christ is related in a manner very different from what we find in the true gospels, and correspondent to those traditions which Mahomet has followed in his Koran. Of this gospel the Moriscoes in Africa have a translation in Spanish; and there is, in the library of prince Eugene of Savoy, a manuscript of some antiquity, containing an Italian translation of the same gospel; made, it is to be supposed, for the use of renegades. This book appears to be no original forgery of the Mahometans; though they have, no doubt, interpolated and altered it since, the better to serve their purpose; and in particular, instead of the *Paraclete*, or *Comforter*, they have in this apocryphal gospel inserted the word *Periclyte*, that is, the "famous," or "illustrious;" by which they pretend their prophet was foretold by name, that being the signification of *Mohammed* in Arabic: and this they say to justify that passage of the Koran, where Jesus Christ is formally asserted to have foretold his coming, under his other name of *Ahmed*, which is derived from the same root as *Mohammed*, and of the same import. From these, or some other forgeries of the same stamp, it is that the Mahometans quote several passages, of which there are not the least footsteps in the New Testament.

4. The number of the prophets, which have been from time to time sent by God into the world, amounts to no less than 224,000, according to one Mahometan tradition; or to 124,000, according to another; among whom 313 were apostles, sent with special commissions to reclaim mankind from infidelity and superstition; and six of them brought new laws or dispensations, which successively abrogated the preceding: these were Adam, Noah, Abraham, Moses, Jesus, and Mahomet. All the prophets in general, the Mahometans believe to have been free from great

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finis and errors of consequence, and professors of one and the same religion, that is, Islam, notwithstanding the different laws and institutions which they observed. They allow of degrees among them, and hold some of them to be more excellent and honourable than others. The first place they give to the revealers and establishers of new dispensations, and the next to the apostles.

In this great number of prophets, they not only reckon divers patriarchs and persons named in scripture, but not recorded to have been prophets (wherein the Jewish and Christian writers have sometimes led the way), as Adam, Seth, Lot, Ishmael, Nun, Joshua, &c. and introduce some of them under different names, as *Enoch*, *Heber*, and *Jethro*, who are called, in the Koran, *Edris*, *Hud*, and *Shoaib*; but several others whose very names do not appear in scripture (though they endeavour to find some persons there to fix them on), as *Saleh*, *Khedr*, *Dhu'lkefi*, &c.

5. The belief of a general resurrection and a future judgment.

When a corpse is laid in the grave, they say he is received by an angel, who gives him notice of the coming of the two examiners; who are two black livid angels, of a terrible appearance, named *Monker* and *Nakir*. These order the dead person to sit upright; and examine him concerning his faith, as to the unity of God, and the mission of Mahomet: if he answer rightly, they suffer the body to rest in peace, and it is refreshed by the air of paradise; but, if not, they beat him on the temples with iron maces, till he roars out for anguish so loud, that he is heard by all from east to west, except men and genii. They then press the earth on the corpse, which is gnawed and stung till the resurrection by 99 dragons, with seven heads each; or, as others say, their fins will become venomous beasts, the grievous ones stinging like dragons, the smaller like scorpions, and the other like serpents: circumstances which some understand in a figurative sense.

As to the soul, they hold, that, when it is separated from the body by the angel of death, who performs his office with ease and gentleness towards the good, and with violence towards the wicked, it enters into that which they call *al berzakh*, or the interval between death and the resurrection. If the departed person was a believer, they say two angels meet it, who convey it to heaven, that its place there may be assigned, according to its merit and degree. For they distinguish the souls of the faithful into three classes: the first of prophets, whose souls are admitted into paradise immediately; the second of martyrs, whose spirits, according to a tradition of Mahomet, rest in the crops of green birds, which eat of the fruits and drink of the rivers of paradise; and the third of other believers, concerning the state of whose souls before the resurrection there are various opinions.

Though some among the Mahometans have thought that the resurrection will be merely spiritual, and no more than the returning of the soul to the place whence it first came (an opinion defended by Ebn Sina, and called by some the *opinion of the philosophers*); and others, who allow man to consist of body only, that it will be merely corporeal; the received opinion is,

that both body and soul will be raised: and their doctors argue strenuously for the possibility of the resurrection of the body, and dispute with great subtilty concerning the manner of it. But Mahomet has taken care to preserve one part of the body, whatever becomes of the rest, to serve for a basis of the future edifice, or rather a leaven for the mass which is to be joined to it. For he taught, that a man's body was entirely consumed by the earth, except only the bone called *al ajb*, which we name the *os coccygis*, or rump-bone; and that, as it was the first formed in the human body, it will also remain uncorrupted till the last day, as a seed from whence the whole is to be renewed; and this, he said, would be effected by a forty years rain, which God should send, and which would cover the earth to the height of 12 cubits, and cause the bodies to sprout forth like plants. Herein, also, is Mahomet beholden to the Jews; who say the same things of the bone *Luz*, excepting that what he attributes to a great rain, will be effected, according to them, by a dew, impregnating the dust of the earth.

The time of the resurrection the Mahometans allow to be a perfect secret to all but God alone; the angel Gabriel himself acknowledging his ignorance in this point, when Mahomet asked him about it. However, they say, the approach of that day may be known from certain signs which are to precede it. These signs they distinguish into two sorts, the lesser and the greater.

The lesser signs are, 1. The decay of faith among men. 2. The advancing of the meanest persons to eminent dignity. 3. That a maid-servant shall become the mother of her mistress (or master); by which is meant, either that towards the end of the world men shall be much given to sensuality, or that the Mahometans shall then take many captives. 4. Tumults and seditions. 5. A war with the Turks. 6. Great distress in the world, so that a man, when he passes by another's grave, shall say, Would to God I were in his place. 7. That the provinces of Irac and Syria shall refuse to pay their tribute. And, 8. That the buildings of Median shall reach to Ahab, or Yahab.

The greater signs are, 1. The sun's rising in the west; which some have imagined it originally did. 2. The appearance of the beast, which shall rise out of the earth, in the temple of Mecca, or on mount Safa, or in the territory of Tayef, or some other place. This beast, they say, is to be 60 cubits high; though others, not satisfied with so small a size, will have her reach to the clouds and to heaven, when her head only is out; and that she will appear for three days, but show only a third part of her body. They describe this monster, as to her form, to be a compound of various species; having the head of a bull, the eyes of a hog, the ears of an elephant, the horns of a stag, the neck of an ostrich, the breast of a lion, the colour of a tiger, the back of a cat, the tail of a ram, the legs of a camel, and the voice of an ass. Some say this beast is to appear three times in several places, and that she will bring with her the rod of Moses and the seal of Solomon; and, being so swift that none can overtake or escape her, will with the first strike all the believers on the face, and mark them with the word *mumen*, i. e. believer; and with the latter will mark the unbelievers on the face likewise, with the

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word *Cafir*, i. e. infidel, that every person may be known for what he really is. They add, that the same beast is to demonstrate the vanity of all religions except Islam, and to speak Arabic. All this stuff seems to be the result of a confused idea of the beast in the Revelations. 3. War with the Greeks, and the taking Constantinople by 70,000 of the posterity of Isaac, who shall not win that city by force of arms, but the walls shall fall down while they cry out, *There is no God but God, God is most great!* As they are dividing the spoil, news will come to them of the appearance of Antichrist; whereupon they shall leave all, and return back. 4. The coming of Antichrist, whom the Mahometans call *Masib al Dajjal*, i. e. the false or lying Christ, and simply *al Dajjal*. He is to be one-eyed, and marked on the forehead with the letters C. F. R. signifying *Cafir*, or infidel. They say that the Jews give him the name of *Messiah Ben David*; and pretend he is to come in the last days, and to be lord both of land and sea, and that he will restore the kingdom to them. 5. The descent of Jesus on earth. They pretend that he is to descend near the white tower to the east of Damascus, when the people are returned from the taking of Constantinople: that he is to embrace the Mahometan religion, marry a wife, get children, kill Antichrist; and at length die after 40 years, or, according to others, 24 years continuance on earth. Under him, they say, there will be great security and plenty in the world, all hatred and malice being laid aside; when lions and camels, bears and sheep, shall live in peace, and a child shall play with serpents unhurt. 6. War with the Jews; of whom the Mahometans are to make a prodigious slaughter, the very trees and stones discovering such of them as hide themselves, except only the tree called *gharkad*, which is the tree of the Jews. 7. The eruption of Gog and Magog, or, as they are called in the east, *Tajuj* and *Majuj*; of whom many things are related in the Koran and the traditions of Mahomet. These barbarians, they tell us, having passed the lake of Tiberias, which the vanguard of their vast army will drink dry, will come to Jerusalem, and there greatly distress Jesus and his companions; till, at his request, God will destroy them, and fill the earth with their carcases, which, after some time, God will send birds to carry away, at the prayers of Jesus and his followers. Their bows, arrows, and quivers, the Moslems will burn for seven years together; and at last, God will send a rain to cleanse the earth and to make it fertile. 8. A smoke which shall fill the whole earth. 9. An eclipse of the moon. Mahomet is reported to have said, that there would be three eclipses before the last hour; one to be seen in the east, another in the west, and the third in Arabia. 10. The returning of the Arabs to the worship of Allat and al Uzza, and the rest of their ancient idols, after the decease of every one in whose heart there was faith equal to a grain of mustard-seed, none but the very worst of men being left alive. For God, they say, will send a cold odoriferous wind, blowing from Syria Damascena, which shall sweep away the souls of all the faithful, and the Koran itself, so that men will remain in the grossest ignorance for 100 years. 11. The discovery of a vast heap of gold and silver by the retreating of the

Euphrates, which will be the destruction of many. 12. The demolition of the Caaba, or temple of Mecca, by the Ethiopians. 13. The speaking of beasts and inanimate things. 14. The breaking out of fire in the province of Hejaz; or, according to others, in Yaman. 15. The appearance of a man of the descendants of Kahtan, who shall drive men before him with his staff. 16. The coming of the Mohdi, or director; concerning whom Mahomet prophesied, that the world should not have an end till one of his own family should govern the Arabians, whose name should be the same with his own name, and whose father's name should also be the same with his father's name; and who should fill the earth with righteousness. This person the Shiites believe to be now alive, and concealed in some secret place till the time of his manifestation; for they suppose him no other than the last of the 12 Imams, named *Mahomet Abu'lkasem*, as their prophet was; and the son of Hassan al Askeri, the 11th of that succession. He was born at Sermanrai, in the 255th year of the Hegira. From this tradition, it is to be presumed, an opinion pretty current among the Christians took its rise, that the Mahometans are in expectation of their prophet's return. 17. A wind which shall sweep away the souls of all who have but a grain of faith in their hearts, as has been mentioned under the tenth sign.

These are the greater signs, which, according to their doctrine, are to precede the resurrection, but still leave the hour of it uncertain: for the immediate sign of its being come will be the first blast of the trumpet, which they believe will be sounded three times. The first they call the *blast of consternation*; at the hearing of which all creatures in heaven and earth shall be struck with terror, except those whom God shall please to exempt from it. The effects attributed to this first sound of the trumpet are very wonderful: for they say, the earth will be shaken, and not only all buildings, but the very mountains levelled; that the heavens shall melt, the sun be darkened, the stars fall, on the death of the angels, who, as some imagine, hold them suspended between heaven and earth; and the sea shall be troubled and dried up, or, according to others, turned into flames, the sun, moon, and stars being thrown into it: the Koran, to express the greatness of the terror of that day, adds, that women who give suck shall abandon the care of their infants, and even the she camels which have gone 10 months with young (a most valuable part of the substance of that nation) shall be utterly neglected. A farther effect of this blast will be that concourse of beasts mentioned in the Koran, though some doubt whether it be to precede the resurrection or not. They who suppose it will precede, think that all kinds of animals, forgetting their respective natural fierceness and timidity, will run together into one place, being terrified by the sound of the trumpet and the sudden shock of nature.

The Mahometans believe that this first blast will be followed by a second, which they call the *blast of extermination*; by which all creatures both in heaven and earth shall die or be annihilated, except those which God shall please to exempt from the common fate; and this, they say, shall happen in the twinkling of an eye, nay in an instant; nothing surviving except God alone, with

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with paradise and hell, and the inhabitants of those two places, and the throne of glory. The last who shall die will be the angel of death.

Forty years after this will be heard the *blast of resurrection*, when the trumpet shall be sounded the third time by Israfil, who, together with Gabriel and Michael, will be previously restored to life, and, standing on the rock of the temple of Jerusalem, shall, at God's command, call together all the dry and rotten bones, and other dispersed parts of the bodies, and the very hairs to judgment. This angel, having, by the divine order, set the trumpet to his mouth, and called together all the souls from all parts, will throw them into his trumpet, from whence, on his giving the last sound, at the command of God, they will fly forth like bees, and fill the whole space between heaven and earth, and then repair to their respective bodies, which the opening earth will suffer to arise; and the first who shall so arise, according to a tradition of Mahomet, will be himself. For this birth the earth will be prepared by the rain above-mentioned, which is to fall continually for 40 years, and will resemble the seed of a man, and be supplied from the water under the throne of God, which is called *living water*; by the efficacy and virtue of which the dead bodies shall spring forth from their graves, as they did in their mother's womb, or as corn sprouts forth by common rain, till they become perfect; after which breath will be breathed into them, and they will sleep in their sepulchres till they are raised to life at the last trump.

When those who have risen shall have waited the limited time, the Mahometans believe God will at length appear to judge them; Mahomet undertaking the office of intercessor, after it shall have been declined by Adam, Noah, Abraham, and Jesus, who shall beg deliverance only for their own souls. They say, that on this solemn occasion God will come in the clouds surrounded by angels, and will produce the books wherein the actions of every person are recorded by their guardian angels, and will command the prophets to bear witness against those to whom they have been respectively sent. Then every one will be examined concerning all his words and actions uttered and done by him in this life; not as if God needed any information in these respects, but to oblige the person to make public confession and acknowledgement of God's justice. The particulars of which they shall give an account, as Mahomet himself enumerated them, are, of their time, how they spent it; of their wealth, by what means they acquired it, and how they employed it; of their bodies, wherein they exercised them; of their knowledge and learning, what use they made of them. To the questions we have mentioned each person shall answer, and make his defence in the best manner he can, endeavouring to excuse himself by casting the blame of his evil deeds on others; so that a dispute shall arise even between the soul and the body, to which of them their guilt ought to be imputed: the soul saying, *O Lord, my body I received from thee; for thou createdst me without a hand to lay hold with, a foot to walk with, an eye to see with, or an understanding to apprehend with, till I came and entered into this body; therefore punish it eternally, but deliver me.* The body, on the other side, will make this apology: *O Lord, thou createdst me like a stock of wood, having neither*

hand that I could lay hold with, nor foot that I could walk with, till this soul, like a ray of light, entered into me, and my tongue began to speak, my eye to see, and my foot to walk; therefore punish it eternally, but deliver me. But God will propound to them the following parable of the blind man and the lame man, which, as well as the preceding dispute, was borrowed by the Mahometans from the Jews. A certain king, having a pleasant garden, in which were ripe fruits, set two persons to keep it, one of whom was blind, and the other lame; the former not being able to see the fruit, nor the latter to gather it: the lame man, however, seeing the fruit, persuaded the blind man to take him upon his shoulders, and by that means he easily gathered the fruit; which they divided between them. The lord of the garden coming some time after, and inquiring after his fruit, each began to excuse himself: the blind man said he had no eyes to see with; and the lame man, that he had no feet to approach the trees. But the king, ordering the lame man to be set on the blind, passed sentence on and punished them both. And in the same manner will God deal with the body and the soul. As these apologies will not avail on that day, so it will be in vain for any one to deny his evil actions; since men and angels, and his own members, nay, the very earth itself, will be ready to bear witness against him.

At this examination, they also believe, that each person will have the book wherein all the actions of his life are written delivered to him: which books the righteous will receive into their right hand, and read with great pleasure and satisfaction; but the ungodly will be obliged to take them, against their wills, in their left, which will be bound behind their backs, their right hand being tied up to their necks.

To show the exact justice which will be observed on this great day of trial, the next thing they describe is the balance, wherein all things shall be weighed. They say it will be held by Gabriel; and that it is of so vast a size, that its two scales, one of which hangs over paradise, and the other over hell, are capacious enough to contain both heaven and hell. Though some are willing to understand what is said in the Koran concerning this balance allegorically, and only as a figurative representation of God's equity; yet the more ancient and orthodox opinion is, that they are to be taken literally; and since words and actions, being mere accidents, are not capable of being themselves weighed, they say that the books wherein they are written will be thrown into the scales, and according as those wherein the good or evil actions are recorded shall preponderate, sentence will be given: those whose balances laden with good works shall be heavy, will be saved; but those whose balances are light, will be condemned. Nor will any one have cause to complain that God suffers any good action to pass unrewarded, because the wicked for the good they do have their reward in this life, and therefore can expect no favour in the next.

This examination being past, and every one's works weighed in a just balance, that mutual retaliation will follow, according to which every creature will take vengeance one of another, or have satisfaction made them for the injuries which they have suffered. And, since there will then be no other way of returning like for like,

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like, the manner of giving this satisfaction will be by taking away a proportional part of the good works of him who offered the injury, and adding it to those of him who suffered it. Which being done, if the angels (by whose ministry this is to be performed) say, *Lord, we have given to every one his due, and there remaineth of this person's good works so much as equalleth the weight of an ant*, God will, of his mercy, cause it to be doubled unto him, that he may be admitted into paradise; but if, on the contrary, his good works be exhausted, and there remain evil works only, and there be any who have not yet received satisfaction from him, God will order that an equal weight of their sins be added unto his, that he may be punished for them in their stead, and he will be sent to hell laden with both. This will be the method of God's dealing with mankind. As to brutes, after they shall have likewise taken vengeance of one another, he will command them to be changed into dust; wicked men being reserved to more grievous punishment, so that they shall cry out, on hearing this sentence passed on the brutes, *Would to God that we were dust also*. As to the genii, many Mahometans are of opinion, that such of them as are true believers, will undergo the same fate as the irrational animals, and have no other reward than the favour of being converted into dust; and for this they quote the authority of their prophet.

The trials being over, and the assembly dissolved, the Mahometans hold, that those who are to be admitted into paradise will take the right-hand way, and those who are destined to hell-fire will take the left; but both of them must first pass the bridge called in Arabic *al Sirat*, which they say is laid over the midst of hell, and describe to be finer than a hair, and sharper than the edge of a sword; so that it seems very difficult to conceive how any one shall be able to stand upon it: for which reason, most of the sect of the Motazalites reject it as a fable; though the orthodox think it a sufficient proof of the truth of this article, that it was seriously affirmed by him who never asserted a falsehood, meaning their prophet: who, to add to the difficulty of the passage, has likewise declared, that this bridge is beset on each side with briars and hooked thorns: which will however be no impediment to the good; for they shall pass with wonderful ease and swiftness, like lightning, or the wind, Mahomet and his Moslems leading the way; whereas the wicked, what with the slipperiness and extreme narrowness of the path, the intangling of the thorns, and the extinction of the light which directed the former to paradise, will soon miss their footing, and fall down headlong into hell, which is gaping beneath them.

As to the punishment of the wicked, the Mahometans are taught, that hell is divided into seven stories or apartments, one below another, designed for the reception of as many distinct classes of the damned. The first, which they call *Jehennam*, they say, will be the receptacle of those who acknowledged one God, that is, the wicked Mahometans; who, after having there been punished according to their demerits, will at length be released. The second, named *Ladha*, they assign to the Jews; the third, named *al Hotama*, to the Christians; the fourth, named *al Sair* to the Sabians; the fifth, named *Sakar*, to the Magians; the sixth, named *al Jahim*, to the idolaters; and the

seventh, which is the lowest and worst of all, and is called *al Hawyat*, to the hypocrites, or those who outwardly professed some religion, but in their hearts were of none. Over each of these apartments they believe there will be set a guard of angels, 19 in number; to whom the damned will confess the just judgment of God, and beg them to intercede with him for some alleviation of their pain, or that they may be delivered by being annihilated.

Mahomet has, in his Koran and traditions, been very exact in describing the various torments of hell, which, according to him, the wicked will suffer both from intense heat and excessive cold. We shall, however, enter into no detail of them here; but only observe, that the degrees of these pains will also vary in proportion to the crimes of the sufferer, and the apartment he is condemned to; and that he who is punished the most lightly of all will be shod with shoes of fire, the fervour of which will cause his skull to boil like a cauldron. The condition of these unhappy wretches, as the same prophet teaches, cannot be properly called either *life* or *death*; and their misery will be greatly increased by their despair of being ever delivered from that place, since, according to that frequent expression in the Koran, *they must remain therein for ever*. It must be remarked, however, that the infidels alone will be liable to eternity of damnation; for the Moslems, or those who have embraced the true religion, and have been guilty of heinous sins, will be delivered thence after they shall have expiated their crimes by their sufferings. The time which these believers shall be detained there, according to a tradition handed down from their prophet, will not be less than 900 years, nor more than 7000. And, as to the manner of their delivery, they say that they shall be distinguished by the marks of prostration on those parts of their bodies with which they used to touch the ground in prayer, and over which the fire will therefore have no power; and that, being known by this characteristic, they will be released by the mercy of God, at the intercession of Mahomet and the blessed: whereupon those who shall have been dead, will be restored to life, as has been said; and those whose bodies shall have contracted any sootiness or filth from the flames and smoke of hell, will be immersed in one of the rivers of paradise, called the *river of life*, which will wash them whiter than pearls.

The righteous, as the Mahometans are taught to believe, having surmounted the difficulties, and passed the sharp bridge abovementioned, before they enter paradise, will be refreshed by drinking at the *pond* of their prophet, who describes it to be an exact square of a month's journey in compass; its water, which is supplied by two pipes from *al Cawthar*, one of the rivers of paradise, being whiter than milk or silver, and more odoriferous than musk, with as many cups set around it as there are stars in the firmament; of which water whoever drinks will thirst no more for ever. This is the first taste which the blessed will have of their future and now near-approaching felicity.

Though paradise be so very frequently mentioned in the Koran, yet it is a dispute among the Mahometans whether it be already created, or to be created hereafter; the Motazalites and some other sectaries

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sectaries asserting, that there is not at present any such place in nature, and that the paradise which the righteous will inhabit in the next life will be different from that from which Adam was expelled. However, the orthodox profess the contrary, maintaining that it was created even before the world, and describe it, from their prophet's traditions, in the following manner.

They say it is situated above the seven heavens (or in the seventh heaven), and next under the throne of God; and, to express the amenity of the place, tell us, that the earth of it is of the finest wheat-flour, or of the purest musk, or, as others will have it, of saffron: that its stones are pearls and jacinths, the walls of its buildings enriched with gold and silver, and that the trunks of all its trees are of gold: among which the most remarkable is the tree called *Tuba*, or the tree of happiness. Concerning this tree, they fable, that it stands in the palace of Mahomet, though a branch of it will reach to the house of every true believer; that it will be laden with pomegranates, grapes, dates, and other fruit, of surprising bigness, and of tastes unknown to mortals. So that, if a man desire to eat of any particular kind of fruit, it will immediately be presented him; or, if he choose flesh, birds ready dressed will be set before him, according to his wish. They add, that the boughs of this tree will spontaneously bend down to the hand of the person who would gather of its fruits, and that it will supply the blessed not only with food, but also with filken garments, and beasts to ride on ready saddled and bridled, and adorned with rich trappings, which will burst forth from its fruits; and that this tree is so large, that a person, mounted on the fleetest horse, would not be able to gallop from one end of its shade to the other in 100 years.

As plenty of water is one of the greatest additions to the pleasantness of any place, the Koran often speaks of the rivers of paradise as a principal ornament thereof: some of these rivers, they say, flow with water, some with milk, some with wine, and others with honey; all taking their rise from the root of the tree *Tuba*.

But all these glories will be eclipsed by the resplendent and ravishing girls of paradise, called, from their large black eyes, *Hur al oyun*, the enjoyment of whose company will be a principal felicity of the faithful. These, they say, are created, not of clay, as mortal women are, but of pure musk; being, as their prophet often affirms in his Koran, free from all natural impurities, defects, and inconveniences incident to the sex, of the strictest modesty, and secluded from public view in pavilions of hollow pearls, so large, that as some traditions have it, one of them will be no less than four parasangs (or, as others say, 60 miles) long, and as many broad.

The name which the Mahometans usually give to this happy mansion, is *al Jannat*, or "the garden;" and sometimes they call it, with an addition, *Jannat al Ferdaws*, "the garden of paradise;" *Jannat Aden*, "the garden of Eden," (though they generally interpret the word *Eden*, not according to its acceptance in Hebrew, but according to its meaning in their own tongue, wherein it signifies "a settled or perpetual habitation;") *Jannat al Marwa*, "the garden of

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abode;" *Jannat al Naim*, "the garden of pleasure;" and the like: by which several appellations some understand so many different gardens, or at least places of different degrees of felicity (for they reckon no less than 100 such in all), the very meanest whereof will afford its inhabitants so many pleasures and delights, that one would conclude they must even sink under them, had not Mahomet declared, that, in order to qualify the blessed for a full enjoyment of them, God will give to every one the abilities of 100 men.

6. God's absolute decree and predestination both of good and evil. The orthodox doctrine is, that whatever hath or shall come to pass in this world, whether it be good, or whether it be bad, proceedeth entirely from the divine will, and is irrevocably fixed and recorded from all eternity in the preserved table: God having secretly predetermined not only the adverse and prosperous fortune of every person in this world, in the most minute particulars, but also his faith or infidelity, his obedience or disobedience, and consequently his everlasting happiness or misery after death; which fate or predestination it is not possible by any foresight or wisdom to avoid.

Of this doctrine Mahomet makes great use in his Koran for the advancement of his designs; encouraging his followers to fight without fear, and even desperately, for the propagation of their faith, by representing to them, that all their caution could not avert their inevitable destiny, or prolong their lives for a moment; and deterring them from disobeying or rejecting him as an impostor, by setting before them the danger they might thereby incur of being, by the just judgment of God, abandoned to seduction, hardness of heart, and a reprobate mind, as a punishment for their obstinacy.

II. *Religious practice.* 1. The first point is *prayer*, under which are also comprehended those legal washings or purifications which are necessary preparations thereto.

Of these purifications there are two degrees, one called *ghosht*, being a total immersion or bathing of the body in water; and the other called *wodu* (by the Persians, *abdest*), which is the washing of their faces, hands, and feet, after a certain manner. The first is required in some extraordinary cases only, as after having lain with a woman, or being polluted by emission of seed, or by approaching a dead body; women also being obliged to it after their courses or childbirth. The latter is the ordinary ablution in common cases, and before prayer, and must necessarily be used by every person before he can enter upon that duty. It is performed with certain formal ceremonies, which have been described by some writers, but much easier apprehended by seeing them done, than by the best description.

That his followers might be more punctual in this duty, Mahomet is said to have declared, that *the practice of religion is founded on cleanliness*, which is the *one half of the faith*, and the *key of prayer*, without which it will not be heard by God. That these expressions may be the better understood, al Ghazali reckons four degrees of purification; of which the first is the cleansing of the body from all pollution, filth, and excrements; the second, the cleansing of the members of

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the body from all wickedness and unjust actions; the third, the cleansing the heart from all blameable inclinations and odious vices; and the fourth, the purging a man's secret thoughts from all affections which may divert their attendance on God; adding, that the body is but as the outward shell, in respect to the heart, which is as the kernel.

Circumcision, though it be not so much as once mentioned in the Koran, is yet held by the Mahometans to be an ancient divine institution, confirmed by the religion of Islam, and, though not so absolutely necessary but that it may be dispensed with in some cases, yet highly proper and expedient. The Arabs used this rite for many ages before Mahomet, having probably learned it from Ishmael, though not only his descendants, but the Hamyarites and other tribes practised the same. The Ishmaelites, we are told, used to circumcise their children, not on the eighth day, as is the custom of the Jews, but when about 12 or 13 years old, at which age their father underwent that operation; and the Mahometans imitate them so far as not to circumcise children before they may be able at least distinctly to pronounce that profession of their faith, *There is no God but God, Mahomet is the apostle of God*; but pitch on what age they please for the purpose, between 6 and 16, or thereabouts.

Prayer was by Mahomet thought so necessary a duty, that he used to call it *the pillar of religion*, and *the key of paradise*; and when the Thakifites, who dwelt at Tayef, sending, in the ninth year of the Hegira, to make their submission to the prophet, after the keeping of their favourite idol had been denied them, begged at least, that they might be dispensed with as to their saying of their appointed prayers, he answered, *That there could be no good in that religion wherein was no prayer*.

That so important a duty, therefore, might not be neglected, Mahomet obliged his followers to pray five times every 24 hours, at certain stated times; viz. 1. In the morning before sun-rise: 2. When noon is past, and the sun begins to decline from the meridian: 3. In the afternoon, before sun-set: 4. In the evening, after sun-set, and before day be shut in; and, 5. After the day is shut in, and before the first watch of the night. For this institution he pretended to have received the divine command from the throne of God himself, when he took his night-journey to heaven; and the observing of the stated times of prayer is frequently insisted on in the Koran, though they be not particularly prescribed therein. Accordingly, at the aforesaid times, of which public notice is given by the Muedhdhins, or Criers, from the steeples of their mosques (for they use no bells), every conscientious Moslem prepares himself for prayer, which he performs either in the mosque or any other place, provided it be clean, after a prescribed form, and with a certain number of praises or ejaculations (which the more scrupulous count by a string of beads), and using certain postures of worship; all which have been particularly set down and described, though with some few mistakes, by other writers, and ought not to be abridged, unless in some special cases, as on a journey, on preparing for battle, &c.

For the regular performance of the duty of prayer among the Mahometans, besides the particulars above

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mentioned, it is also requisite that they turn their faces, while they pray, towards the temple of Mecca; the quarter where the same is situated, being, for that reason, pointed out within their mosques by a nich, which they call *al Mehrab*; and without, by the situation of the doors opening into the galleries of the steeples: there are also tables calculated for the ready finding out their Keblah, or part towards which they ought to pray, in places where they have no other direction.

2. *Alms* are of two sorts, *legal* and *voluntary*. The *legal alms* are of indispensable obligation, being commanded by the law, which directs and determines both the portion which is to be given, and of what things it ought to be given; but the *voluntary alms* are left to every one's liberty, to give more or less, as he shall see fit. The former kind of alms some think to be properly called *zacam*, and the latter *sadakat*; though this name be also frequently given to the legal alms. They are called *zacam*, either because they *increase* a man's store by drawing down a blessing thereon, and produce in his soul the virtue of liberality; or because they *purify* the remaining part of one's substance from pollution, and the soul from the filth of avarice; and *sadakat*, because they are a proof of a man's sincerity in the worship of God. Some writers have called the legal alms *tithes*; but improperly, since in some cases they fall short, and in others exceed that proportion.

3. *Fasting* is a duty of so great moment, that Mahomet used to say it was *the gate of religion*, and that *the odour of the mouth of him who fasteth is more grateful to God than that of musk*; and al Ghazali reckons *fasting one fourth part of the faith*. According to the Mahometan divines, there are three degrees of fasting: 1. The restraining the belly and other parts of the body from satisfying their lusts: 2. The restraining the ears, eyes, tongue, hands, feet, and other members, from sin; and, 3. The fasting of the heart from worldly cares, and restraining the thought from every thing besides God.

The Mahometans are obliged, by the express command of the Koran, to fast the whole month of Ramadan, from the time the new moon first appears, till the appearance of the next new moon; during which time they must abstain from eating, drinking, and women, from day-break till night or sun-set. And this injunction they observe so strictly, that, while they fast, they suffer nothing to enter their mouths, or other parts of their body, esteeming the fast broken and null, if they smell perfumes, take a clyster or injection, bathe, or even purposely swallow their spittle; some being so cautious, that they will not open their mouths to speak lest they should breathe the air too freely: the fast is also deemed void, if a man kiss or touch a woman, or if he vomit designedly. But after sun-set they are allowed to refresh themselves, and to eat and drink, and enjoy the company of their wives till day-break; though the more rigid begin the fast again at midnight. This fast is extremely rigorous and mortifying when the month of Ramadan happens to fall in summer (for the Arabian year being lunar, each month runs through all the different seasons in the course of 33 years), the length and heat of the days making the observance of it much more difficult and uneasy than in winter.

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The reason given why the month of Ramadan was pitched on for this purpose is, that on that month the Koran was sent down from heaven. Some pretend, that Abraham, Moses, and Jesus, received their respective revelations in the same month.

4. The pilgrimage to Mecca is so necessary a point of practice, that, according to a tradition of Mahomet, he who dies without performing it may as well die a Jew or a Christian; and the same is expressly commanded in the Koran.

The temple of Mecca stands in the midst of the city, and is honoured with the title of *Masjad al elbaram*, i. e. *the sacred or inviolable temple*. What is principally revered in this place, and gives sanctity to the whole, is a square stone building, called the CAABA; (see that article).

To this temple every Mahometan, who has health and means sufficient, ought, once at least in his life, to go on pilgrimage; nor are women excused from the performance of this duty. The pilgrims meet at different places near Mecca, according to the different parts from whence they come, during the months of Shawal and Dhu'lkaada; being obliged to be there by the beginning of Dhu'lhajja; which month, as its name imports, is peculiarly set apart for the celebration of this solemnity.

At the place above mentioned the pilgrims properly commence such; when the men put on the Ibram or sacred habit, which consists only of two woollen wrappers, one wrapped about their middle to cover their privities, and the other thrown over their shoulders, having their heads bare, and a kind of slippers which cover neither the heel nor the instep, and so enter the sacred territory in their way to Mecca. While they have this habit on, they must neither hunt nor fowl, (though they are allowed to fish); which precept is so punctually observed, that they will not kill even a louse or flea if they find them on their bodies: there are some noxious animals, however, which they have permission to kill during the pilgrimage, as kites, ravens, scorpions, mice, and dogs given to bite. During the pilgrimage, it behoves a man to have a constant guard over his words and actions; to avoid all quarrelling or ill-language, all converse with women, and all obscene discourse; and to apply his whole attention to the good work he is engaged in.

The pilgrims, being arrived at Mecca, immediately visit the temple; and then enter on the performance of the prescribed ceremonies, which consist chiefly in going in procession round the Caaba, in running between the mounts Safa and Merwa, in making the station on mount Arafat, and slaying the victims, and shaving their heads in the valley of Mina.

In compassing the Caaba, which they do seven times, beginning at the corner where the black stone is fixed, they use a short quick pace, the three first times they go round it, and a grave ordinary pace the four last; which, it is said, was ordered by Mahomet, that his followers might show themselves strong and active to cut off the hopes of the infidels, who gave out that the immoderate heats of Medina had rendered them weak. But the aforesaid quick pace they are not obliged to use every time they perform this piece of devotion, but only at some particular times.

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So often as they pass by the black stone, they either kiss it, or touch it with their hand and kiss that.

The running between Safa and Merwa is also performed seven times, partly with a slow pace and partly running: for they walk gravely till they come to a place between two pillars; and there they run, and afterwards walk again; sometimes looking back, and sometimes stopping, like one who had lost something, to represent Hagar seeking water for her son; for the ceremony is said to be as ancient as her time.

On the ninth of Dhu'lhajja, after morning-prayer, the pilgrims leave the valley of Mina, whither they come the day before; and proceed in a tumultuous and rushing manner to mount Arafat, where they stay to perform their devotions till sun-set: then they go to Mozdalifa, an oratory between Arafat and Mina; and there spend the night in prayer and reading the Koran. The next morning by day break they visit *al Masber al Karam*, or "the sacred monument;" and, departing thence before sun-rise, haste by Batn Mohaffer to the valley of Mina, where they throw seven stones at three marks or pillars, in imitation of Abraham, who, meeting the devil in that place, and being by him disturbed in his devotions, or tempted to disobedience when he was going to sacrifice his son, was commanded by God to drive him away by throwing stones at him; though others pretend this rite to be as old as Adam, who also put the devil to flight in the same place, and by the same means.

This ceremony being over, on the same day, the tenth of Dhu'lhajja, the pilgrims slay their victims in the said valley of Mina; of which they and their friends eat part, and the rest is given to the poor. These victims must be either sheep, goats, kine, or camels; males, if of either of the two former kinds; and females if of either of the latter; and of a fit age. The sacrifices being over, they shave their heads and cut their nails, burying them in the same place; after which the pilgrimage is looked on as completed: though they again visit the Caaba, to take their leave of that sacred building.

The rapid success which attended the propagation of this new religion was owing to causes that are plain and evident, and must remove, or rather prevent, our surprize, when they are attentively considered. The terror of Mahomet's arms, and the repeated victories which were gained by him and his successors, were, no doubt, the irresistible arguments that persuaded such multitudes to embrace his religion and submit to his dominion. Besides, his law was artfully and marvellously adapted to the corrupt nature of man; and, in a more particular manner, to the manners and opinions of the eastern nations, and the vices to which they were naturally addicted: for the articles of faith which it proposed were few in number, and extremely simple; and the duties it required were neither many nor difficult, nor such as were incompatible with the empire of appetites and passions. It is to be observed farther, that the gross ignorance, under which the Arabians, Syrians, Persians, and the greatest part of the eastern nations, laboured at this time, rendered many an easy prey to the artifice and eloquence of this bold adventurer. To these causes of the progress of Mahometism, we may add the bitter dissensions and

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cruel animosities that reigned among the Christian sects, particularly the Greeks, Nestorians, Eutychi-ans, and Monophysites; dissensions that filled a great part of the East with carnage, assassinations, and such detestable enormities, as rendered the very name of Christianity odious to many. We might add here, that the Monophysites and Nestorians, full of resentment against the Greeks, from whom they had suffered the bitterest and most injurious treatment, assisted the Arabians in the conquest of several provinces, into which, of consequence, the religion of Mahomet was afterwards introduced. Other causes of the sudden progress of that religion will naturally occur to such as consider attentively its spirit and genius, and the state of the world at this time.

MAHOMETANS, those who believe in the religion and divine mission of Mahomet. See MAHOMET, MAHOMETANISM, and ALCORAN.

MAHRATTA. See MARHATTA.

MAHWAH, or MAWEE, in botany; an East-Indian tree, so called by the natives of Bahar and the neighbouring countries, but of which the Shanscrit name is *Madhuca* or *Madhudruma*. According to Lieut. C. Hamilton, by whom a very particular account of this tree is given in the *Asiatic Researches* ‡, it is of the class of the polyandria-monogynia of Linnaeus, but of a genus not described by him. The calyx is monophyllous, quadrid, half divided, and imbricated in its divided part; the two opposite and outer parts covering partially the two opposite and inner. The corolla is monopetalous, having an inflated tube for its lower part, of near an inch long, thick, fleshy, and of a cream colour: from this arise nine small leaves, as it were, like petals from a calyx, that are imbricated and twisted, one over the other, from right to left, clasping the lower part of the style in a point; by which they seem to serve, in some respect, like a forceps, to detach the whole corolla at the season of its dropping. There are no filaments; but the antheræ, which are in number most commonly twenty-six, long, scabrous, and spear-headed, are inserted in rows, on the inside and upper part of the tube of the corolla. The style is long, round, and tapering, and projects about an inch beyond the corolla; it is succeeded by a drupe, with a thick pericarpium, bilocular, containing two seeds or kernels covered with a dark brown skin: there are often, however, three of these, in three separate divisions. The flowers rise in bunches, from the extremities of the smaller branches; and have each a pedicle of about an inch and a half long: these are mostly turned downwards, whence the corollas more easily drop off.

The tree, when full grown, is about the size of a common Mango tree, with a bushy head and oval leaves a little pointed; its roots spreading horizontally, are sunk but little in the earth: the trunk, which is often of a considerable thickness, rises seldom to any great height, without giving off branches; it is, however, not uncommon to see it shoot up clear to the length of eight or ten feet: the wood itself is moderately hard, fine grained, and of a reddish colour. By incision the tree affords a resinous gum from the bark.

The flowers are of a nature very extraordinary, “differing essentially (says Mr Hamilton) from those of any other plant with which I am acquainted, as they

have not, in any respect, the usual appearance of such, but rather resemble *berries*; and I, like many others, had long conceived them to be the fruit of the Mahwah.” The tree drops its leaves in the month of February, and early in March these flowers begin to come out in clusters of thirty, forty, or fifty, from the extremity of every small branch; and, from this period till the latter end of April, as the flowers come to maturity (for they never open or expand), they continue falling off, with their antheræ, in the mornings, a little after sun-rise; when they are gathered; and afterwards dried by an exposure of a few days in the sun: when thus prepared, they very much resemble a dried grape, both in taste and flavour. Immediately after the flowers drop off, fresh shoots are made for the new leaves, which soon make their appearance, coming presently to their full growth.

The fruit (*properly* so called) is of two sorts in shape; the one resembling a small walnut, the other somewhat larger and pointed: it is ripe towards the middle of May; and continues dripping from the tree till the whole fall, which is generally about the beginning or towards the middle of June. The outer covering, or *pericarpium*, which is of a soft texture, commonly bursts in the fall, so that the seeds are very easily squeezed out of it: the seeds are somewhat of the shape but longer than an olive. These seeds are replete with a thick oil, of the consistence of butter or *ghee*, which is obtained by expression.

From this description it may easily be conceived, that the Mahwah tree and its productions are of singular and general use, especially in those dry and barren countries, which, from the nature of their situation, are not so well calculated for producing in plenty or perfection the other necessities of life.

The corolla or flowers, after being dried as before described, are eaten by the natives raw or dressed with their *curries*; and, when even simply boiled with rice, they afford a strengthening and wholesome nourishment. They are indeed, our author tells us, often applied to a less laudable purpose; for being fermented, they yield by distillation a strong spirit, which the people here sell so very cheap, that for one *pie* (about a half-penny) may be purchased no less than a *cutchasseer* (above a pint English) with which any man may get completely drunk. These flowers make an article of trade; being exported from this country to Patna and elsewhere in no inconsiderable quantities.

The oil yielded by the fruit, as before mentioned, resembles ghee so much, that, being cheaper, the natives often mix it with that commodity. They use it the same as ghee in their victuals, and in the composition of some sorts of sweetmeats; and burn it in their lamps. It is also regarded as a salutary remedy, applied exteriorly to wounds and all cutaneous eruptions. It is at first of the consistence of common oil, but soon coagulates: after being kept for some time, it acquires a bitterish taste and rancid smell, which renders it somewhat less agreeable as an article of food: but this is an inconvenience which, by the oil being properly clarified and prepared at first, might be perhaps avoided. This oil is also exported both in its adulterated and original state to Patna and other parts of the low country.

The author does not know any purpose to which
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‡ Vol. I. art.
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Mahwah. the gum has ever been applied: but if found upon trial to be of use, he informs us that it might be collected in large quantities; and that the best season for this would be in the months of March and April, about the time the flowers come out, when the tree seems to be most replete with it: such an operation, indeed, would probably diminish its produce in the fruit and flower; but where it was sufficiently cultivated, the loss in those could be but little felt.

The wood, from what has been already said of it, cannot be expected to be often had in beams of any considerable length, so as to make it so very useful in building as it would otherwise be from its not being liable to be eat by the white ants: Mr Keir, however, told our author, that when he was at Chowfee (a village upon the Caramnassa near Buxar), he had beams of it which were to the best of his remembrance above 20 feet long: but in many other respects it is a most useful wood; and as it is tough, and of a strong texture, it might perhaps be employed to advantage in ship-building; in which case, if properly cultivated in many grounds that seem well adapted for it and fit for little else, it might thus in time become a valuable article in that branch at Calcutta, whither it could easily be transported during the rainy season from almost any part of these countries, by several rivers that are then sufficiently full to float it down.

The tree, it is said, though it does not refuse a rich soil, will grow in the most barren ground, even amongst stones and gravel, where there is the least appearance of a soil; and it seems to destroy all the smaller trees and brushwood about it. It does not require much moisture, seeming to produce nearly as well in the driest as in most favourable years, and in every situation; and is therefore admirably fitted for the convenience of the inhabitants of these hilly countries, which are peculiarly subject to long and severe droughts during the hot months.

"Yet, notwithstanding its utility, and the immense quantity of ground that seems so well adapted to the growth of it, both here and in the neighbouring provinces of Catak, Pacheet, Rotas, &c. (greatest part of which, indeed, seems fit for no other useful production) I have myself never observed (says our author), nor can I find any of my acquaintance who ever have remarked, one single tree in its infant state. We can see, every where, full grown trees in great abundance; but, never meeting with any young plants, both I and all whom I have spoken to on the subject, are at some loss to conceive how they should have come here: neither can the country people themselves, of whom I have inquired, give any rational account of this; although it appears pretty evident that numbers of them must have been cultivated some time or other, every village having many of them growing about it. This is a circumstance which sufficiently marks the true character of the lower order of natives in their most supine indolence and sloth; owing chiefly, perhaps, to the ignorance and stupid rapacity of their Rajahs, Zemindars, and other landholders, and their total inattention to the welfare of those dejected wretches from whom they derive their consequence and power. Of their base indifference to the interests of those whom they thus affect to hold beneath their regard, many striking instances occurred to

Mahwah. me in the course of my inquiries upon this very subject; and it was not long ago that, asking some questions concerning the mahwah of a Zemindar in this neighbourhood, he answered, that 'it was the food of the poor people, and how should he know any thing about it!'

"It was this strange neglect of the culture of it, and a knowledge of its usefulness (continues our author), which first led me to enquire into the nature of this tree, from which the bulk of the people hereabouts already draw such great benefit, in order to know whether they might not increase it without any great trouble to themselves; and whether thereby the revenue might not also be increased, and a certain provision be made against famines, from which the natives often suffer severely in these higher districts.

"To effect this, it would be necessary to give the Ryots every possible encouragement to raise the tree from the seeds; but as the torpid apathy of these people, whether natural or acquired, will ever prevent their being moved to any exertion by a prospect, however alluring, of distant advantage, I apprehend the only way of bringing this about would be making the planting and raising of a certain number of mahwahs (in proportion to the value of the tenure) an article in their kabooleats or agreements.

"The tree, as has been already observed, will grow almost any where: it ought to be sown about the beginning of the rains, either in beds (to be afterwards transplanted) or at about thirty or forty feet distance, in the ground designed for it. It is said that in seven years the trees will give flowers and fruit; in ten, they will yield about half of their common produce; and that in twenty years they come to their full growth; after which, if my information be good, they will last near one hundred years. This account, I acknowledge, must necessarily be very vague and uncertain, as I never have met with a single person who appeared to have had either opportunity or inclination to observe its progress. Such, however, is what the country people say of it.

"I am told that a good tree will easily give four puckha maunds (about three hundred weight avoirdupois) of dried flowers, which will sell here for about two rupees; and of seeds it will afford about two maunds; and this, of oil, will yield 26 seers puckha weight (near 60 lb.) which, in a year like this, when oil is cheap, will sell at this place for two rupees more. It is to be observed, however, that every tree will not give so much, neither are the flowers and oil so clear in any part of the hills as at Chitra; but, allowing only a half of this or less, to be the product of each tree (though it might be rendered still much greater by the very least care and industry in the cultivation of it), within the space of 20 years a subsistence might be raised to the inhabitants, and a considerable revenue to the proprietors of the lands throughout an immense tract of country; the greatest part of which, in its present state, is little better than a barren waste, and cannot pay one single anna to the Zemindar or the government. That such an advantage might be derived from it, may be proved by the most moderate calculation: for supposing the trees to be sown at 40 feet distance from each other, on each begah (about the third of an acre) might stand eight trees; and

Mahwah
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Maiden.

supposing the product of each tree to be only half a rupee, there would be four rupees of annual value on a begah of ground; half of which going to the proprietor, it would thus give a far better rent than the generality of the best grounds in these parts; and the labourer would have a produce, without any other trouble than that of sowing the seed, and fencing the ground whilst the trees were young; and that of annually gathering the flowers and preparing the oil when they arrive at their proper size; and they would probably begin to give a produce within less than 10 years after the sowing.

"As this tree will yield nearly its usual quantity of flowers and fruit in seasons when, for want of rain, every other crop fails; if thus cultivated, it would afford the inhabitants a sure and certain resource, under the most dreadful, and what has hitherto been to them the most destructive, of all calamities, famine. It is well known, that the rice and other sorts of grain which form the chief part of their sustenance, require a considerable degree of moisture to bring them to perfection; an unusually dry season destroys the harvest in those articles, and reduces the Ryots in general to the utmost misery; a predicament into which they could hardly fall, even in the severest dearth of grain, whilst they had plenty of the flowers and fruit of the mahwah to depend upon."

MAIA, (fab. hist.), the daughter of Atlas and Pleione. She was the mother of Mercury by Jupiter. She was one of the Pleiades, the most luminous of the seven sisters; (see PLEIADES). Also, a surname of Cybele.

MAIDEN, an instrument for beheading criminals.

Of the use and form of this instrument Mr Pennant gives the following account. "It seems to have been confined to the limits of the forest of Hardwick, or the 18 towns and hamlets within its precincts. The time when this custom took place is unknown; whether Earl Warren, lord of this forest, might have established it among the sanguinary laws then in use against the invaders of the hunting rights, or whether it might not take place after the woollen manufactures at Halifax began to gain strength, is uncertain. The last is very probable; for the wild country around the town was inhabited by a lawless set, whose depredations on the cloth-tenters might soon stifle the efforts of infant industry. For the protection of trade, and for the greater terror of offenders by speedy execution, this custom seems to have been established, so as at last to receive the force of law, which was, 'That if a felon be taken within the liberty of the forest of Hardwick, with goods stolen out, or within the said precincts, either hand-habend, back-berand, or confession'd, to the value of thirteen-pence halfpenny, he shall, after three market-days or meeting-days within the town of Halifax, next after such his apprehension, and being condemned, be taken to the gibbet, and there have his head cut from its body.'

"The offender had always a fair trial; for as soon as he was taken, he was brought to the lord's bailiff at Halifax: he was then exposed on the three markets (which here were held thrice in a week), placed in a stocks, with the goods stolen on his back, or, if the theft was of the cattle kind, they were placed by him;

and this was done both to strike terror into others, and to produce new informations against him. The bailiff then summoned four freeholders of each town within the forest to form a jury. The felon and prosecutors were brought face to face; the goods, the cow or horse, or whatsoever was stolen, produced. If he was found guilty, he was remanded to prison, had a week's time allowed for preparation, and then was conveyed to this spot, where his head was struck off by this machine. I should have premised, that if the criminal, either after apprehension, or in the way to execution, could escape out of the limits of the forest (part being close to the town), the bailiff had no farther power over him; but if he should be caught within the precincts at any time after, he was immediately executed on his former sentence.

"This privilege was very freely used during the reign of Elizabeth: the records before that time were lost. Twenty-five suffered in her reign, and at least twelve from 1623 to 1650; after which I believe the privilege was no more exerted.

"This machine of death is now destroyed; but I saw one of the same kind in a room under the parliament-house at Edinburgh, where it was introduced by the regent Morton, who took a model of it as he passed through Halifax, and at length suffered by it himself. It is in form of a painter's easel, and about ten feet high: at four feet from the bottom is a cross bar, on which the felon lays his head, which is kept down by another placed above. In the inner edges of the frame are grooves; in these is placed a sharp ax, with a vast weight of lead, supported at the very summit with a peg; to that peg is fastened a cord, which the executioner cutting, the ax falls, and does the affair effectually, without suffering the unhappy criminal to undergo a repetition of strokes, as has been the case in the common method. I must add, that if the sufferer is condemned for stealing a horse or a cow, the string is tied to the beast, which, on being whipped, pulls out the peg, and becomes the executioner."

MAIDEN is also the name of a machine first used in Yorkshire, and since introduced into other places, for washing of linen; consisting of a tub 19 inches high, and 27 in diameter at the top, in which the linen is put, with hot water and soap, to which is adapted a cover, fitting it very closely, and fastened to the tub by two wedges; through a hole in the middle of the cover passes an upright piece of wood, kept at a proper height by a peg above, and furnished with two handles, by which it is turned backward and forward: to the lower end of this upright piece is fastened a round piece of wood, in which are fixed several pieces, like cogs of a wheel. The operation of this machine is to make the linen pass and repass quick through the water.

MAIDEN-Rents, in our old writers, a noble paid by the tenants of some manors on their marriage. This was said to be given to the lord for his omitting the custom of marcheta, whereby he was to have the first night's lodging with his tenant's wife; but it seems more probably to have been a fine for a licence to marry a daughter.

MAIDENHEAD, a town of Berks, 26 miles from London, with a stone bridge over the Thames.

Maiden,
Maiden-
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Maiden-
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Maienne.

It is governed by a high-steward, a mayor, a steward, and 10 aldermen, out of which last two bridgemaisters are chosen every year. Here is a gaol both for debtors and felons. The town stands partly in the parish of Bray and partly in that of Cookham; and here is a chapel peculiar to the corporation, the minister whereof is chosen by the inhabitants, and not obliged to attend the bishop's visitation. Here are several alms-houses and charities. This town, now so considerable, did not begin to flourish till, by the building of its bridge, travellers were brought this way, who before used a ferry at that called *Babham's End*, two miles north of it. The barge pier-bridge is maintained by the corporation, for which they are allowed the tolls both over and under it. The bridge-pier divides Berks from Bucks. There is a great trade here in malt, meal, and timber, which they carry in their barges to London. As this is the great thoroughfare from thence to Bath, Bristol, and other south-west parts of England, the adjacent wood or thicket has been noted for many robberies. The market here is on Wednesdays; there are three fairs; and here are frequent horse-races.

MAIDSTONE, a town of Kent, in England, 36 miles from London, seated on the river Medway, a branch of which runs through it. It is a corporation, and sends two members to parliament. Its chief trade, besides linen-thread, which it makes to great perfection, is in hops; of which there are great plenty of plantations about the town, as well as orchards of cherries. The tide flows quite up to the town, and brings up barges, &c. of 50 or 60 tons. It has a fine stone bridge. One of the public gaols for the county is kept in this town; and the custody of weights and measures, renewed by the standard of King Henry VII. was committed to it by parliament, as being in the centre of Kent: for which reason the knights of the shire are always elected, and the courts of justice always held here, and generally the assizes. The archbishop of Canterbury is constant parson of this parish, which is his peculiar, and served by his curate. Here are four charity schools, in which are above 100 boys and girls, who are visited once a week and catechised by the minister. This is such a plentiful country, and the lands hereabouts are so rich, that London is supplied with more commodities from hence than from any market-town in England; particularly with the large bullocks that come from the Weald of Kent, which begins but six miles off; with timber, wheat, and great quantities of hops, apples, and cherries; with a sort of paving-stone, eight or ten inches square, that is exceeding durable; and with the fine white sand for glass-houses and stationers. There are so many gentlemen's seats within 10 miles, that it is rare to find a town of so much trade and business so full of gentry and good company. The market here, which is the best in the county, is on Thursday; it has another on the second Tuesday of every month, granted them by George II. in 1751; and fairs on February 13th, May 12th, June 20th (called *Garlic fair*), and October 17th. Here was a college or hospital, erected by Archbishop Boniface; and a chantry, by Archbishop Thomas Arundel, which is now the free school.

MAIENNE, a considerable, handsome, and po-

pulous town in France, with the title of a duchy; seated on a river of the same name, in W. Long. 0. 35. N. Lat. 48. 18.

MAIGNAN (Emanuel), a religious minim, and one of the greatest philosophers of his age, was born of an ancient and noble family at Thoulouse in 1601. Like the famous Pascal, he became a complete mathematician without the assistance of a teacher; and filled the professor's chair at Rome in 1636, where, at the expence of Cardinal Spada, he published his book *De Perspectiva Horaria*. He returned to Thoulouse in 1650, and was created provincial: the king, who in 1660 entertained himself with the machines and curiosities in his cell, made him offers by Cardinal Mazarine, to draw him to Paris; but he humbly desired to spend the remainder of his days in a cloyster. He published a course of philosophy, 4 vols 8vo, at Thoulouse; to the second edition of which he added two treatises, one against the vortices of Descartes, and the other on the speaking trumpet invented by Sir Samuel Morland. He is said to have studied even in his sleep, his very dreams being employed in theorems, the demonstrations of which would awaken him with joy. He died in 1676.

MAJESTY, a title given to kings, which frequently serves as a term of distinction. The word seems composed of the two Latin words, *major* "greater," and *status* "state." The emperor is called *Sacred Majesty*, *Imperial Majesty*, and *Cæsarean Majesty*: The king of Hungary is styled *His Apostolic Majesty*. The king of Spain is termed *His most Catholic Majesty*; and the king of Portugal, *His most Faithful Majesty*. The king of France used to be called *His most Christian Majesty*; and when he treated with the emperor, the word *Sacred* was added: He is now plain *King of the French*. —With respect to other kings, the name of the kingdom is added; as *His Britannic Majesty*, *His Polish Majesty*, &c. Formerly princes were more sparing in giving titles, and more modest in claiming them: before the reign of Charles V. the king of Spain had only the title of *Highness*; and before that of Hen. VIII. the kings of England were only addressed under the titles of *Grace* and *Highness*.

Under the Roman republic, the title *Majesty* (*majestas*) belonged to the whole body of the people, and to the principal magistrates; so that to diminish or wound the majesty of the commonwealth, was to be wanting in respect to the state or to its ministers. But the power afterwards passing into the hands of a single person, the appellation of *Majesty* was transferred to the emperor and the imperial family. Pliny compliments Trajan on his being contented with the title of *Greatness*; and speaks very invidiously of those who affected that of *Majesty*. And yet this last seems to be the most modest and just title that can be attributed to sovereigns, since it signifies no more than the royalty or sovereign power.

MAIL INDUCTION, an ancient custom for the priest and people of country-villages to go in procession to some adjoining wood on a May-day morning; and return in a kind of triumph, with a May-pole, boughs, flowers, garlands, and other tokens of the spring. This May-game, or rejoicing at the coming of the spring, was for a long time observed, and still is in some parts of England; but there was thought

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to be so much heathen vanity in it, that it was condemned and prohibited within the diocese of Lincoln by the good old bishop Grosthead.

MAIL (*maille*), a term primarily applied to the meshes or holes in net-work.

Coat of MAIL. See COAT. It is called also a *habergeon*. Anciently they also wore shirts of mail under the waistcoat, to serve as a defence against swords and poniards. We also read of gloves of mail.

MAIL, or *Mall*, also signifies a round ring of iron; whence the play of pall-mall, from *palla* "a ball," and *maille* "the round ring through which it is to pass."

MAIL, or *Maille*, in our old writers, a small kind of money. Silver half-pence were likewise termed *mailles*, 9 Hen. V. By indenture in the mint, a pound weight of old sterling silver was to be coined into 360 sterlings or pennies, or 720 *mails* or half-pennies, or 1440 farthings. Hence the word *mail* was derived, which is now vulgarly used in Scotland to signify an annual rent.

MAIL, or *Maill*, on ship-board, a square machine composed of a number of rings interwoven net-wise, and used for rubbing off the loose hemp which remains on lines or white cordage after it is made.

MAIL is likewise used for the leather bag wherein letters are carried by the post.

MAIL-Coaches. See COACH.

Action of *MAILS* and *Duties*, in Scots law. See LAW, p. 699, § 7. and p. 712, § 20.

MAIL (*Black*). See BLACK-Mail.

MAILLA (Joseph-Anne-Marie de Moyriac de), a learned Jesuit, was born in the castle of Maillac in the Bugey, and appointed a missionary to China, whither he went in 1703. At the age of 28 he had acquired so great skill in the characters, arts, sciences, mythology, and ancient books of the Chinese, as to astonish even the learned. He was greatly beloved and esteemed by the emperor Kam-Hi, who died in 1722. He, together with other missionaries, was employed by that prince to draw a chart of China and Chinese Tartary, which was engraved in France in the year 1732. He drew likewise particular charts of some of the provinces of this vast empire; with which the emperor was so pleased, that he settled the author at his court. The great annals of China were also translated into French by Father Mailla, and his manuscript was transmitted to France in 1737. This work was published in 12 volumes quarto, under the inspection of M. Grosier, and is the first complete history of that extensive empire. The style, which was full of hyperbole and bombast, has been revised by the editor, and the speeches which extended to too great a length, and had too much sameness in them, have been omitted. Father Mailla, after having resided 45 years in China, died at Pekin on the 28th of June 1748, in the 79th year of his age. Kieu-Lung the reigning emperor paid the expences of his funeral. He was a man of a lively and gentle character, capable of the most persevering labour and the most unremitting activity.

MAILLET (Benoît de), descended from a noble family in Lorraine, was born in 1659, and appointed, at the age of 33, consul general for Egypt. He fulfilled this office for 16 years with great ability, sup-

ported the king's authority against the janizaries, and greatly extended the trade of France into that part of Africa. As a recompence for his services, the king bestowed upon him the consulship of Leghorn, which is the first and most considerable consulship in his gift. Being at last appointed in 1715 to visit the sea-ports in the Levant and on the coast of Barbary, he was so successful in the execution of his commission, that he obtained permission to retire with a considerable pension. He settled at Marseilles; where he died in 1738, in the 79th year of his age. He was a man of a lively imagination, and gentle manners; in society he was very amiable, and he possessed the strictest probity. He was fond of praise, and very anxious about the reputation of genius. During the whole of his life he paid particular attention to the study of natural history; and his principal object was to become acquainted with the origin of our globe. On this important subject he left some curious observations, which have been published in octavo under the title of *Telliamed*, which is the name *de Maillet* written backwards. The editor Abbé Mascrier has given to this work the form of dialogue. An Indian philosopher is introduced as explaining to a French missionary his opinion concerning the nature of the globe, and the origin of mankind: and, which is very incredible, he supposes it to have come out of the waters, and makes an abode uninhabitable by man the birthplace of the human race. His great object is to prove, that all the strata of which this globe is composed, even to the tops of the highest mountains, have come from the bosom of the waters; that they are the work of the sea, which continually retires to allow them gradually to appear. *Telliamed* dedicated his book to the illustrious Cyrano de Bergerac author of the imaginary "Travels to the sun and moon." In the humorous epistle which is addressed to him, the Indian philosopher informs us that these dialogues are nothing but a collection of dreams and fancies. He cannot be accused of having broken his word; but he may well be reproached with not having written them in the same style with his letter to Cyrano, and with not having displayed equal liveliness and humour. A subject the most extravagant is handled in the gravest manner, and his ridiculous opinion is delivered with all the serious air of a philosopher. Of the six dialogues which compose the work, the four first contain many curious observations truly philosophical and important: in the other two we find nothing but conjectures, fancies, and fables, sometimes amusing, but always absurd. To Maillet we are indebted also for "A Description of Egypt," collected from his memoirs by the editor of *Telliamed*, 1743, 4to, or in 2 vols 12mo.

MAIM, MAIHEM, or *Mayhem*, in law, a wound by which a person loses the use of a member that might have been a defence to him; as when a bone is broken, a foot, hand, or other member cut off, or an eye put out; though the cutting off an ear or nose, or breaking the hinder-teeth, was formerly held to be no maim. A maim by castration was anciently punished with death, and other maims with loss of member for member; but afterwards they were only punished by fine and imprisonment. It is now enacted by the statute 22 & 23 Car. II. that if any person, from malice afore-

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aforethought, shall disable any limb or member of any of the king's subjects with an intent to disfigure him, the offender, with his aiders and abettors, shall be guilty of felony without benefit of clergy; though no such attainder shall corrupt the blood, or occasion forfeiture of lands, &c.

MAIMBOURG (Louis), born at Nanci in 1610, became a Jesuit in 1626; and acquired reputation as a teacher, but yet more by the many histories which he published. The Jansenists criticised his history of Arianism, and that of the *Iconoclastes*; and his history of Calvinism, published in 1681, stirred up a violent paper-war against him, the operations whereof he left entirely to his enemies, without giving himself any trouble offensively or defensively. He was degraded by the general of the Jesuits, on account of his having declared too boldly in favour of the Gallican church against the Ultramontains. He retired into the abbey of St Victor, where he died in 1686.

He ought not to be confounded with *Theodore Maimbourg* his cousin; who embraced Calvinism, afterwards returned to the Romish church, returned back to the reformed religion, embraced Socinianism, and died at London about the year 1693, after having published some works.

MAIMONIDES (Moses), or MOSES THE SON OF MAIMON, a celebrated rabbi, called by the Jews *the eagle of the doctors*, was born of an illustrious family at Cordova in Spain, in 1131. He is commonly named *Moses Ægyptius*, because he settled in Egypt, where he spent his whole life in quality of physician to the sultan. Here he opened a school, which was soon filled with pupils from all parts; from Alexandria and Damascus especially, whose proficiency under him spread his fame all over the world. He was no less eminent in philosophy, mathematics, and divinity, than in medicine. Casaubon affirms it may be truly said of him, as Pliny of old said of Diodorus Siculus, that "he was the first of his tribe who ceased to be a trifler." It would be tedious to enumerate all the works of Maimonides; some were written originally in Arabic, but are now extant only in Hebrew translations. "Those (says Collier), who desire to learn the doctrine and the canon law contained in the Talmud, may read Maimonides's compendium of it in good Hebrew, in his book intitled *Iad*; wherein they will find great part of the fables and impertinencies in the Talmud entirely discarded. But the *More Nevochim* is the most valued of all his works; designed to explain the obscure words, phrases, metaphors, &c. in scripture, which, when literally interpreted, have either no meaning or appear absurd.

MAIN, an epithet usually applied by sailors to whatever is principal, as opposed to whatever is inferior or secondary. Thus the main land is used in contradistinction to an island or peninsula; and the main-mast, the main-wale, the main-keel, and the main-hatchway, are in like manner distinguished from the fore and mizen masts, the channel-wales, the false keel, and the fore and after hatchways, &c.

MAINOUR, MANOUR, or *Meinour* (from the French *manier*, i. e. *manu tradere*), in a legal sense denotes the thing that a thief taketh away or stealeth: As to be taken with the mainour (*Pl. Cor.* fol. 179.),

is to be taken with the thing stolen about him: And again (fol. 194.) it was presented, that a thief was delivered to the sheriff or viscount, together with the mainour: And again (fol. 186.), if a man be indicted, that he feloniously stole the goods of another, where, in truth, they are his own goods, and the goods he brought into the court as the mainour; and if it be demanded of him, what he saith to the goods, and he disclaim them; though he be acquitted of the felony, he shall lose the goods: And again (fol. 149.), if the defendant were taken with the manour, and the manour be carried to the court, they, in ancient times, would arraign him upon the manour, without any appeal or indictment. Cowel. See Blackst Comment. Vol. III. 71. Vol. IV. 303.

MAINPRIZE. See *Falsè IMPRISONMENT*.

The writ of mainprize, *manucapio*, is a writ directed to the sheriff (either generally, when any man is imprisoned for a bailable offence, and bail hath been refused; or specially, when the offence or cause of commitment is not properly bailable below), commanding him to take sureties for the prisoner's appearance, usually called *mainpernors*, and to set him at large. Mainpernors differ from bail, in that a man's bail may imprison, or surrender him up before the stipulated day of appearance; mainpernors can do neither, but are barely sureties for his appearance at the day: bail are only sureties that the parties be answerable for the special matter for which they stipulate, mainpernors are bound to produce him to answer all charges whatever. See *HABEAS Corpus*.

MAINTENANCE, in law, bears a near relation to BARRETRY; being an officious intermeddling in a suit that no way belongs to one, by maintaining or assisting either party with money or otherwise, to prosecute or defend it: a practice that was greatly encouraged by the first introduction of uses. This is an offence against public justice, as it keeps alive strength and contention, and prevents the remedial process of the law into an engine of oppression. And therefore, by the Roman law, it was a species of the *crimen falsi*, to enter into any confederacy, or do any act to support another's law-suit, by money, witnesses, or patronage. A man may, however, maintain the suit of his near kinsman, servant, or poor neighbour, out of charity and compassion, with impunity. Otherwise the punishment by common law is fine and imprisonment; and by the statute 32 Hen. VIII. c. 9. a forfeiture of 10l.

MAINTENON (Madame de), a French lady of extraordinary fortune, descended from an ancient family, and whose proper name was *Frances Daubigne*, was born in 1635. Her parents by misfortunes being ill able to support her, she fell to the care of her mother's relations; to escape which state of dependence, she was induced to marry that famous old buffoon the Abbé Scarron, who subsisted himself only on a pension allowed him by the court for his wit and parts. She lived with him many years, which Voltaire makes no scruple to call the happiest years of her life; but when he died in 1660, she found herself as indigent as she was before her marriage. Her friends indeed endeavoured to get her husband's pension continued to her, and presented so many petitions to the king about it, all beginning with "The widow Scarron most humbly prays

Mainprize
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Maintenon.

Major.

prays your majesty's, &c." that he was quite weary of them, and has been heard to exclaim, "Must I always be pestered with the widow Scarron?" At last, however, through the recommendation of Madame de Montespan, he settled a much larger pension on her, with a genteel apology for making her wait so long; and afterward made choice of her to take care of the education of the young duke of Maine, his son by Madame de Montespan. The letters she wrote on this occasion charmed the king, and were the origin of her advancement; her personal merit effected all the rest. He bought her the lands of Maintenon, the only estate she ever had; and finding her pleased with the acquisition, called her publicly *Madam de Maintenon*; which was of great service to her in her good fortune, by releasing her from the ridicule attending that of Scarron. Her elevation was to her only a retreat; the king came to her apartment every day after dinner, before and after supper, and continued there till midnight: here he did business with his ministers, while Madam de Maintenon, employed in reading or needlework, never showed any desire to talk of state-affairs, and carefully avoided all appearance of cabal or intrigue; she did not even make use of her power to dignify her own relations. About the latter end of the year 1685, Louis XIV. married her, he being then in his 48th and she in her 50th year; and that piety with which she inspired the king to make her a wife instead of a mistress, became by degrees a settled disposition of mind. She prevailed on Louis to found a religious community at St Cyr, for the education of 300 young ladies of quality; and here she frequently retired from that melancholy of which she complains so pathetically in one of her letters, and which few ladies will suppose she should be liable to in such an elevated situation. But, as M. Voltaire says, if any thing could show the vanity of ambition, it would certainly be this letter. Madam de Maintenon could have no other uneasiness than the uniformity of her manner of living with a great king; and this made her once say to the Count Daubigné her brother, "I can hold it no longer; I wish I was dead." The answer he made to her was, "You have then a promise to marry the Almighty!" Louis, however, died before her in 1715; when she retired wholly to St Cyr, and spent the rest of her days in acts of devotion; and what is most surprising is, that her husband left no certain provision for her, recommending her only to the duke of Orleans. She would accept no more than a pension of 80,000 livres, which was punctually paid her till she died in 1719. A collection of her letters has been published, and translated into English; from which familiar intercourses her character will be better known than from description.

MAJOR, in the art of war, the name of several officers of very different ranks and functions.

MAJOR-general. See GENERAL.

MAJOR of a Regiment of Foot, the next officer to the lieutenant-colonel, generally promoted from the eldest captain: he is to take care that the regiment be well exercised, to see it march in good order, and to rally it in case of being broke in action: he is the only officer among the infantry that is allowed to be on horseback in time of action, that he may the more readily execute the colonel's orders.

MAJOR of a Regiment of Horse, as well as foot, ought
N^o 192.

to be a man of honour, integrity, understanding, courage, activity, experience, and address: he should be master of arithmetic, and keep a detail of the regiment in every particular: he should be skilled in horsemanship, and ever attentive to his business: one of his principal functions is, to keep an exact roster of the officers for duty: he should have a perfect knowledge in all the military evolutions, as he is obliged by his post to instruct others, &c.

Town-MAJOR, the third officer in order in a garrison, and next to the deputy-governor. He should understand fortification, and has a particular charge of the guards, rounds, patrols, and centinels.

Brigade-MAJOR, is a particular officer appointed for that purpose only in camp: he goes every day to head-quarters to receive orders from the adjutant-general: there they write exactly whatever is dictated to them: from thence they go and give the orders, at the place appointed for that purpose, to the different majors or adjutants of the regiments which compose that brigade, and regulate with them the number of officers and men which each are to furnish for the duty of the army; taking care to keep an exact roster, that one may not give more than another; and that each march in their tour: in short, the major of brigade is charged with the particular detail in his own brigade, in much the same way as the adjutant-general is charged with the general detail of the duty of the army. He sends every morning to the adjutant-general an exact return, by battalion and company, of the men of his brigade missing at the retreat, or a report expressing that none are absent: he also mentions the officers absent with or without leave.

As all orders pass through the hands of the majors of brigade, they have infinite occasions of making known their talents and exactness.

MAJOR of Artillery, is also the next officer to the lieutenant-colonel. His post is very laborious, as the whole detail of the corps particularly rests with him; and for this reason all the non-commissioned officers are subordinate to him, as his title of *serjeant-major* imports: in this quality they must render him an exact account of every thing which comes to their knowledge, either regarding the duty or wants of the artillery and soldiers. He should possess a perfect knowledge of the power of artillery, together with all its evolutions. In the field he goes daily to receive orders from the brigade-major, and communicates them with the parole to his superiors, and then dictates them to the adjutant. He should be a very good mathematician, and be well acquainted with every thing belonging to the train of artillery, &c.

MAJOR of Engineers, commonly with us called *Sub-directors*, should be very well skilled in military architecture, fortification, gunnery, and mining. He should know how to fortify in the field, to attack and defend all sorts of posts, and to conduct the works in a siege, &c. See ENGINEER.

Aid-MAJOR, is on sundry occasions appointed to act as major, who has a pre-eminence above others of the same denomination. Our horse and foot-guards have their guidons, or second and third majors.

Serjeant-MAJOR, is a non-commissioned officer, of great merit and capacity, subordinate to the adjutant as he is to the major. See SERJEANT.

Drum-MAJOR, is not only the first drummer in the
5 regiment

Major.

Major. regiment, but has the same authority over his drummers as the corporal has over his squad. He instructs them in their different beats; is daily at orders with the serjeants, to know the number of drummers for duty. He marches at their head when they beat in a body. In the day of battle, or at exercise, he must be very attentive to the orders given him, that he may regulate his beats according to the movements ordered.

Fife-Major, is he that plays the fife on that instrument, and has the same authority over the fifiers as the drum-major has over the drummers. He teaches them their duty, and appoints them for guards, &c.

MAJOR, in law, a person who is of age to manage his own affairs. By the civil law a man is not a major till the age of 25 years; in England, he is a major at 21, as in Normandy at 20.

MAJOR, in logic, is understood of the first proposition of a regular syllogism. It is called *major*, because it has a more extensive sense than the minor proposition, as containing the principal term. See **LOGIC**.

MAJOR and *Minor*, in music, are applied to concords which differ from each other by a semi-tone. See **CONCORD**.

Major-tone is the difference between the fifth and fourth; and major semi-tone the difference between the major fourth and the third. The major tone surpasses the minor by a comma.

MAJOR-Domo, an Italian term, frequently used to signify a steward or master of the household. The title of *major domo* was formerly given in the courts of princes to three different kinds of officers. 1. To him who took care of what related to the prince's table, or eating; otherwise called *eleater*, *praefectus mensae*, *architriclinus*, *dapifer*, and *princeps coquorum*.—2. Major-domo was also applied to the steward of the household.—3. The title of major-domo was also given to the chief minister, or him to whom the prince deputed the administration of his affairs, foreign and domestic, relating to war as well as peace. Instances of major-domos in the two first senses are frequent in the English, French, and Norman affairs.

MAJOR (John), a scholastic divine and historian, was born at Haddington, in the province of East Lothian in Scotland. It appears from some passages in his writings, that he resided a while both at Oxford and Cambridge. He went to Paris in 1493, and studied in the college of St Barbe, under the famous John Boulac. Thence he removed to that of Montacute, where he began to study divinity under the celebrated Standouk. In the year 1498, he was entered of the college of Navarre. In 1505, he was created doctor in divinity; returned to Scotland in 1519, and taught theology during several years in the university of St Andrew's. But at length, being disgusted with the quarrels of his countrymen, he went back to Paris, and resumed his lectures in the college of Montacute, where he had several pupils, who afterwards became men of great eminence. About the year 1530, he returned once more to Scotland, and was chosen professor of theology at St Andrew's, of which he afterwards became provost; and there died in 1547, aged 78. His logical treatises form one immense folio; his commentary on Aristotle's physics makes another; and his theological works amount to several volumes of the same size. These masses of crude and useless disqui-

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sition were the admiration of his contemporaries. A Majorca, work, less prized in his own age, was to make him known to posterity. His book *De Gestis Scotorum*, was first published at Paris by Badius Ascensius, in the year 1521. He rejects in it some of the fictions of former historians; and would have had greater merit if he had rejected more. He intermingles the history of England with that of Scotland; and has incurred the censure of some partial writers, for giving an authority to the authors of the former nation, which he refuses to those of his own. Bede, Caxton, and Froissard, were exceedingly useful to him. What does the greatest honour to this author is, the freedom with which he has censured the rapacity and indolence of ecclesiastics, and the strain of ridicule with which he treats the pope's supremacy. The style in which he wrote does not deserve commendation. Bishop Spotiswood calls it *Sorbonnic* and *barbarous*.

MAJORCA, an island of the Mediterranean, lying between Yvica on the west and Minorca on the east. These three islands were anciently called *Balears*, supposed to be from the skill of their inhabitants in sling-ing, for which they were very remarkable. Originally they belonged to the Carthaginians; but during the wars of that people with the Romans, they seem to have regained their liberty. In 122 B. C. they were subdued by Metellus the Roman consul, who treated the inhabitants with such cruelty, that out of 30,000 he scarce left 1000 alive. He then built two cities on Majorca; one called *Palma*, now *Majorca*, to the east; the other to the west, named *Pollentia*, now no longer in being. The island continued subject to the Romans, and to the nations who over-ran the western part of the empire, for many ages. At last it was subdued by the Moors about the year 800. By them the island was put in a much better condition than it ever was before or since. The Moors being very industrious, and also populous, surrounded the whole coast with fortifications, that is, with a kind of towers and lines between them; cultivated every spot in the island that was not either rock or sand; and had no fewer than 15 great towns, whereas now there are not above three. Neither was it at all difficult for the Moorish monarch to bring into the field an army much superior in number to the inhabitants that are now upon it, taking in all ranks, sexes, and ages. In 1229, the island was subdued by the king of Arragon, who established in it a new kingdom, feudatory to that of Arragon, which was again destroyed in 1341 by the same monarchs; and ever since, the island hath been subject to Spain, and hath entirely lost its importance. It is about 60 miles long, and 45 broad. The air is clear and temperate, and, by its situation, the heat in summer is so qualified by the breezes, that it is by far the most pleasant of all the islands in the Mediterranean. There are some mountains; but the country is generally flat, and of such an excellent soil, that it produces great quantities of corn as good in its kind as any in Europe. Oil, wine, and salt, are very plentiful, as also black cattle and sheep; but deer, rabbits, and wild-fowl, abound so much, that they alone are sufficient for the subsistence of the inhabitants. There are no rivers, but a great many springs and wells, as well as several good harbours. The inhabitants are robust, active, and good seamen.

Majorca,
Mairan.

MAJORCA, a handsome, large, rich, and strong town, in the island of the same name, with a bishop's see. It contains about 6000 houses, and 22 churches, besides the cathedral. The squares, the cathedral, and the royal palace, are magnificent structures. A captain-general resides there, who commands the whole island; and there is a garrison against the incursion of the Moors. It was taken by the English in 1706; but was retaken in 1715, since which time it has been in the hands of the Spaniards. It is seated on the south-west part of the island, where there is a good harbour, 70 miles north-east of Yvica, 120 south-east of Barcelona, 140 east of Valencia, and 300 from Madrid. E. Long. 2. 55. N. Lat. 39. 36.

MAIRAN (Jean-Jacques d'Ortous de), descended from a noble family at Besiers, was born in that city in 1678, and died at Paris of a defluxion of the lungs on the 20th of February 1771, at the age of 93. He was one of the most illustrious members of the academy of sciences and of the French academy. Being early connected with the former society, he, in the year 1741, succeeded Fontenelle in the office of secretary. This station he filled with the most distinguished success till the year 1744; and, like his predecessor, possessed the faculty of placing the most abstract subjects in the clearest light; a talent which is very rare, but which appears conspicuous in all his works. The chief of them are, 1. *Dissertation sur la Glace*, the last edition of which was printed in 1749, 12mo. This excellent little tract has been translated into German and Italian. 2. *Dissertation sur la cause de la lumiere des Phosphores*, 1717, 12mo. 3. *Traité historique & physique de l'Aurore Boréale*, first published in 12mo 1733, and afterwards much enlarged and printed in 4to in 1754. The system embraced by the author is liable to be controverted; but the book displays great taste and erudition. 4. *Lettre au Pere Parennin, contenant diverses questions sur la Chine*, 12mo. This is a very curious work, and is full of that philosophical spirit which characterises the author's other publications. 5. A great number of papers in the memoirs of the academy of sciences (since 1719), of which he published some volumes. 6. Several Dissertations on particular subjects, which form only small pamphlets. 7. The *Eloges* of the Academicians of the Academy of Sciences, who died in 1741, 1742, 1743, in 12mo. 1747. Without imitating Fontenelle, the author attained almost equal excellence by his talent of discriminating characters, appreciating their worth, and giving them their due share of praise, without at the same time concealing their defects.

Mairan's reputation extended itself into foreign countries. He was a member of the imperial academy at Petersburg, of the royal academy of London, of the institution at Bologna, of the royal societies of Edinburgh and Upsal, &c. The gentleness and sweetness of his manners made him be considered as a perfect model of the social virtues. He possessed that amiable politeness, that agreeable gaiety, and that steady firmness, which never fail to procure love and esteem. But we must add, says M. Saverien, that every thing had a reference to himself; self-love and a regard to his own reputation were the motives of all his actions. He was deeply affected with censure or

applause, and yet he had many friends. Uniting much gentleness of disposition to an ingenious and agreeable expression of countenance, he possessed the art of insinuating himself into the good graces of others, so as to have the way to elevation and success. He was honoured with protection and particular marks of regard by the duke of Orleans the regent, who bequeathed to him his watch in his will. The prince of Conti loaded him with favours: and the chancellor Daguesseau, observing in him great originality and ingenuity of thought, appointed him president of the *Journal des Savans*; a station which he filled very much to the satisfaction of the public and of the learned. The private and selfish views imputed to him by M. Saverien never made him deficient in what was due to the strictest probity. An expression of his is remembered, which could have proceeded only from sentiment; "An honest man (said he) is one whose blood is refreshed with the recital of a good action." He was ready at repartee. One day he happened to be in company with a gentleman of the gown, and to differ with him in opinion upon some point which had no more connection with jurisprudence than with geometry. "Sir (said the magistrate, who supposed that a learned man was a perfect idiot out of his own sphere), we are not now talking of Euclid or Archimedes"—"No, nor of Cujas nor Barthole!" replied the academician.

MAIRE (Streights le), a passage to Cape Horn, situated between Terra del Fuego and Staten island; which, being discovered by Le Maire, obtained his name. It is now, however, less made use of than formerly, ships going round Staten Island as well as Terra del Fuego.

MAISTRE (Louis-Isaac le), better known by the name of Sacy, was born at Paris in 1613. His genius very early discovered itself. After an excellent course of study under the direction of the abbot of saint Cyran, he was raised to the priesthood in 1648, and soon after was chosen, on account of his virtues, to be director of the religious of Port Royal des Champs. As this monastery bore the reputation of Jansenism, their enemies were furnished with a pretence for persecuting them. In 1661 the director was obliged to conceal himself; and in 1666 he was committed to the Bastille. During his confinement he composed the book *Figures de la Bible*; in which, according to the Molinists, allusions are made to the sufferings endured by the Jansenists. If we may believe a Jesuit writer, the gentlemen of Port Royal and those who opposed their errors are represented in the 92d figure, the former by David, the latter by Saul. Rehoboam in the 116th figure, Jezebel in the 130th, Ahasuerus in the 148th and 150th, and Darius in the 160th, in the opinion of this author, represent Louis XIV. The writer of these anecdotes, of which we do not answer for the authenticity, adds, that when Sacy wished to reproach his persecutors, he always did it by means of the holy fathers. If this is the key to those enigmatical portraits and allusions, which it is pretended are to be found in that book, certain we are it was not discovered by the spirit of charity. Besides, it is not certain that Sacy was the author of that book; for it is much more probable that

Maire,
Maistre.

Maitre,
Maitland.

that it was composed by Nicolas Fontaine his fellow prisoner.

To Sacy's confinement the public are indebted for a French translation of the Bible. This work was finished in 1668, the evening before the feast of All Saints; on which day he recovered his liberty, after an imprisonment of two years and a half. He was presented to the king and the minister; and all the favour he asked from them was, that they would send several times a year to examine the state of the prisoners in the Bastille. Le Maître continued at Paris till 1675, when he retired to Port-Royal, which he was obliged to leave in 1679. He went to settle at Pomponne, where he died January 4th 1684, at the age of 71. From him we have 1. *La Traduction de la Bible*, with explanations of the spiritual and literal meaning taken from the fathers, the greater part of which was done by du Fossé, Huré, and Tourneux. This is the best French translation which has yet appeared, and the most esteemed edition is that of Paris in 32 volumes 8vo, 1682 and following years. The author translated the New Testament three times, because the first time the style of it appeared too much laboured and too refined, and the second too simple. A counterfeit of the edition in 32 vols 8vo, was published at Brussels in 40 vols 12mo. The best editions of this version have been published at Brussels, 1700, in 3 vols 4to; at Amsterdam, under the name of *Paris*, 1711, 8 vols in 12mo; at Paris 1713, in 2 vols 4to; and in 1715, with notes and a concordance, 4 vols folio. 2. *Une Traduction des Pseaumes selon l'Hebreu & la Vulgate*, in 12mo. 3. *Une Version des Homelies de St Chrysostome sur St Matthieu*, in 3 vols 8vo. 4. *La Traduction de l'Imitation de Jesus Christ (sous le nom de Beuil, prieur de Saint-Val)*, Paris 1663, 8vo. 5. *Celle de Phedre*, 12mo. (sous le nom de Saint-Aubin). 6. *De trois Comédies de Térence*, in 12mo. 7. *Des Lettres de Bongars (sous le nom de Brianville)*. 8. *Du Pöeme de St Prosper sur les ingrates*, in 12mo. en vers & en prose. 9. *Les Enluminures de l'Almanach des Jésuites*, 1654, 12mo. reprinted in 1733. In 1653 there appeared a print representing the overthrow of Jansenism anathematized by the two powers, and the confusion of the disciples of the bishop of Ypres, who are going to seek refuge with the Calvinists. The monks of Port-Royal were greatly provoked at this print, and Sacy thought that he would lower its reputation by means of his *Enluminures*, which Racine has ridiculed in one of his letters. It is indeed very strange that men of taste and piety should write satires to the injury of one another. 10. *Heures de Port-Royal*, in 12mo. 11. *Lettres de Piété*, Paris 1690, 2 vols 8vo.

MAITLAND (Sir Richard), a Scottish poet and eminent public character, who flourished during the greatest part of the 16th century. The ancient name of the family was *Maitlant*; and the first who distinguished the house was an old Sir Richard, famous for his valour, who lived some time subsequent to the middle of the 13th century. He was then baron or laird of Thirlstane in Haddingtonshire. In 1346 the family must have been eminent; for in that year John Maitland of Thirlstane married Agnes daughter of Patrick earl of March. On the 28th January 1432, William Maitland of Thirlstane obtained from Archibald duke of Touraine and earl of Douglas a grant of

the lands of Blyth and others—William, the father of Maitland, our poet, and who (while his father John Maitland of Thirlstane was yet alive) first had the title of Lethington, married Martha daughter of George Lord Seaton, and was killed at Flodden in 1513.

Sir Richard was born in 1496; was educated at St Andrew's; and went to France to study the laws. Upon his return, says Mackenzie, he became a favourite of James V. and in the books of federunt is marked an extraordinary lord of session in 1553. By a letter of James VI. it appears that Sir Richard had served his grandfater, goodfater, goodam, his mother, and himself, faithfully in many public offices. He unhappily became blind before 1561, or his 65th year: but notwithstanding, he was made a senator of the college of justice, by the title of Lord Lethington, 12th Nov. 1561; and on the 20th Dec. 1562, one of the counsellor and lord-privy seal; which last office he held till 1567, when he resigned it in favour of John his second son. Sir Richard continued a lord of session during all the troublesome times of the regents in the minority of James VI. till 1584, when he resigned; and died 20th March 1586. By Mary his wife, daughter of Thomas Cranston of Corsly, he had seven children, of whom three were sons: 1. William, the famous secretary; 2. Sir John, afterward Lord Thirlstane and chancellor; and, 3. Thomas, who is the prolocutor with Buchanman in his treatise *De Jure Regni*.—Sir Richard is never mentioned by writers but with respect as a man of great talents and virtue. Knox indeed blames him for taking a sum of money, to suffer Cardinal Beaton to escape when imprisoned at Seaton. But Knox (Mr Pinkerton observes) was too vehement, and often blamed without cause.—One poem of Sir Richard's was published in the Evergreen; but no more of his works appeared till they were inserted in the Collection in 2 vols published some years ago by Mr Pinkerton. Besides poems, he wrote a MS. (formerly, as Dr Mackenzie shows, in the earl of Winton's library), the title of which was, "The Chronicle and Historie of the House and Surname of Seaton, unto the moneth of November, in the yeir of God An Thufand Five Hundereth Fifty Aught yeirs. Collectit, writ, and fet furth, be Sir Richard de Maitland of Leithington, knight, daughter-sonne of the said hous." Mackenzie gives an account of it.—Mr Forbes, in the preface to his Decisions, tells us there is still a MS. of the decisions from 15th December 1550 till 30th July 1565 by our author, folio, in the advocates library.

MAITLAND (John), Lord Thirlstane, chancellor of Scotland, was the second son of Sir Richard. He was born in the year 1537, educated in Scotland, and was afterwards sent to France to study the law. On his return to his native country, he commenced advocate; in which profession his abilities became eminently conspicuous. In 1567, his father resigned the privy-seal in his favour. This office he kept till 1570; when, for his loyalty to the queen, he lost the seal, and it was given to George Buchanan. He was made a senator of the college of justice, or lord of session, in 1581; secretary of state in 1584; and lord high chancellor in 1586. The chancellor's power and influence created him many enemies among the Scottish nobility, who made several attempts to destroy him,

Maitland, but without success. In 1589, he attended the king on his voyage to Norway, where his bride, the princess of Denmark, was detained by contrary wind. The marriage was immediately consummated; and they returned with the queen to Copenhagen, where they spent the ensuing winter. During their residence in Denmark, the chancellor became intimately acquainted with the celebrated Tycho-Brahe. In 1590 he was created Lord Maitland of Thirlstane—Towards the end of the year 1592, the chancellor incurred the queen's displeasure, for refusing to relinquish his lordship of Musselburgh, which she claimed as being a part of Dunfermline. He absented himself for some time from court; but was at length restored to favour, and died of a lingering illness in the year 1595, much regretted by the king. He bears a high character both for talents and integrity among all historians. Melville, who writes the *Memoirs*, Mr Pinkerton observes, was his personal enemy, so must not receive much credit in his censures of him. Beside his Scottish poetry in the *Maitland Collection*, he wrote several Latin epigrams, &c. to be found in the *Delicia Poetarum Sectorum*, vol. ii. The chancellor's only son, John Lord Thirlstane, was first made viscount and then earl of Lauderdale, by James VI. 1624. The earl's son was John, the only duke of Lauderdale, and born 1616 at Lethington.

MAITTAIRE (Michael), an eminently learned writer, was born in 1668. Dr South, canon of Christ-Church, made him a student of that house, where he took the degree of M. A. March 23. 1696. From 1695 till 1699 he was second master of Westminster school; which was afterwards indebted to him for *Græca Linguae Dialecti, in usum Scholæ Westmonasteriensis*, 1706, 8vo; and for "The English Grammar, applied to, and exemplified in, the English Tongue, 1712," 8vo. In 1711, he published "Remarks on Mr Whiston's Account of the Convocation's proceedings with relation to himself, in a Letter to the right reverend Father in God George Lord Bishop of Bath and Wells," 8vo.; also "An Essay against Arianism, and some other Heresies; or a Reply to Mr William Whiston's Historical Preface and Appendix to his Primitive Christianity revived," 8vo. In 1709 he gave the first specimen of his great skill in typographical antiquities, by publishing *Stephanorum Historia, vitas ipsorum ac libros complectens*, 8vo; which was followed in 1717 by *Historia Typographorum aliquot Parisiensium, vitas et libros complectens*, 8vo. In 1719, *Annales Typographici ab artis inventæ origine ad annum MD*, 4to. The second volume, divided into two parts, and continued to the year 1536, was published at the Hague in 1702; introduced by a letter of John Toland, under the title of *Conjectura verisimilis de prima Typographiæ Inventione*. The third volume, from the same press, in two parts, continued to 1557, and (by an Appendix) to 1664, in 1725. In 1733 was published at Amsterdam what is usually considered as the fourth volume, under the title of *Annales Typographici*

ab artis inventæ origine, ad annum MDCLXIV, opera Mich. Maittaire, A. M. Editio nova, auctior et emendatior, tomus primi pars posterior (A). In 1741 the work was closed at London, by *Annalium Typographicorum Tomus quintus et ultimus, indicem in tomos quatuor præuntes complectens*; divided, like the two preceding volumes, into two parts. In the intermediate years, Mr Maittaire was diligently employed on various works of value. In 1713 he published by subscription *Opera et Fragmenta Veterum Poëtarum*, 1713, two volumes in folio: the title of some copies is dated 1721. In 1714, he was the editor of a Greek Testament, in 2 vols. The Latin writers, which he published separately, most of them with good indexes, came out in the following order: In 1713, *Christus Patiens; Justin; Lucretius; Phædrus; Sallust; Terence*. In 1715, *Catullus; Tibullus; Propertius; Cornelius Nepos; Florus; Horace; Juvenal; Ovid*, 3 vols; *Virgil*. In 1711, *Cæsar's Commentaries; Martial; Quintus Curtius*. In 1718 and 1725, *Vellius Paterculus*. In 1719, *Lucan*. In 1720, *Bonifonii Carmina*. In 1711 he published, *Batrachomyomachia Græce ad veterum exemplarium fidem recusa: Glossa Græca; variantibus lectionibus, versionibus Latinis, commentariis et indicibus illustrata*, 8vo. In 1722, *Miscellanea Græcorum aliquot Scriptorum Carmina, cum versione Latina et Notis*, 4to. In 1724 he compiled, at the request of Dr John Freind (at whose expence it was printed), an Index to the works of *Aræteus*, to accompany the splendid folio edition of that author in 1723. In 1725 he published an excellent edition of *Anacreon* in 4to, of which no more than 100 copies were printed, and the few errata in each copy corrected by his own hand. A second edition of the like number was printed in 1741, with six copies on fine writing paper. In 1726 he published *Petri Petiti Medici Parisiensis in tres priores Arætai Capadocis Libros Commentarii, nunc primum editi*, 4to. This learned commentary was found among the papers of Grævius. From 1728 to 1733 he was employed in publishing *Marmorum Arundelianorum, Seldenianorum, aliorumque Academiæ Oxoniensæ donatorum, una cum Commentariis et Indice, editio secunda*, folio; to which an Appendix was printed in 1733. *Epistola D. Mich. Maittaire ad D. P. Des Maizeaux, in qua Indicis in Annales Typographicos methodus explicatur, &c.* is printed in "The Present State of the Republic of Letters," August 1733, p. 142. The life of Robert Stephens in Latin, revised and corrected by the author, with a new and complete list of his works, is prefixed to the improved edition of R. Stephens's *Thesaurus*, 4 vols. in folio, in 1734. In 1736 appeared *Antiquæ Inscriptiones duæ*, folio; being a commentary on two large copper tables discovered near Heraclea, in the Bay of Tarentum. In 1738 were printed at the Hague *Græca Linguae Dialecti in Scholæ Regiæ Westmonasteriensis usum recogniti opera Mich. Maittaire*. In 1739 he addressed to the empress of Russia a small Latin poem, under the title of *Carmen Epinicium Augustissimæ Russorum Imperatrici sacrum*. His name not having been printed in the title-page, it

(A) The awkwardness of this title has induced many collectors to dispose of their first volume, as thinking it superseded by the second edition: but this is by no means the case; the volume of 1719 being equally necessary to complete the set as that of 1733, which is a revision of all the former volumes. The whole work, when properly bound, consists, *ad libitum*, either of five volumes or of nine.

Maize
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Malacca.

it is not so generally known that he was editor of Plutarch's *Apophthegmata*, 1741, 4to. The last publication of Mr Maittaire was a volume of poems in 4to, 1742, under the title of *Senilia, sive Poetica aliquot in argumentis varii generis tentamina*. Mr Maittaire died in 1747, aged 79. His valuable library, which had been 50 years collecting, was sold by auction by Messrs Cock and Langford, at the close of the same year, and the beginning of the following, taking up in all 44 nights. Mr Maittaire, it may be added, was patronised by the first earl of Oxford, both before and after that gentleman's elevation to the peerage, and continued a favourite with his son the second earl. He was also Latin tutor to Mr Stanhope, the earl of Chesterfield's favourite son.

MAIZE, or INDIAN CORN. See ZEA.

MALE. See LEMUR.

MALABAR, the name given to a great part of the west coast of the peninsula, on this side of the Ganges, from the kingdom of Baglala to Cape Comorin, or only from the north extremity of the kingdom of Canara as far as Cape Comorin. It is bounded by the mountains of Balligate on the east; by Decan on the north; and on the west and south is washed by the Indian sea.

MALACA (anc. geog.), surnamed *Federatorum* by Bliny; a maritime town of Bætica: A Carthaginian colony according to Strabo; so called from *Malach*, signifying "salt;" a place noted for pickled or salted meat. Now *Malaga*, a port town of Granada in Spain. W. Long. 4. 45. N. Lat. 36. 40.

MALACCA, the most southerly part of the great peninsula beyond the Ganges, is about 600 miles in length, and contains a kingdom of the same name. It is bounded by the kingdom of Siam on the north; by the bay of Siam and the Indian ocean on the east; and by the straits of Malacca, which separate it from the island of Sumatra, on the south-west. This country is more to the south than any other in the East Indies; and comprehends the towns and kingdoms of Ratan, Pahan, Igohor, Pera, Queda, Borkelon, Ligor; and to the north the town and kingdom of Tanassery, where the Portuguese formerly carried on a great trade. This last either does or did belong to the king of Siam. The people of Malacca are in general subject to the Dutch, who possess all the strong places on the coast, and compel them to trade on their own terms, excluding all other nations of Europe from having any commerce with the natives.

The Malays are governed by feudal laws. A chief, who has the title of *king* or *sultan*, issues his commands to his great vassals, who have other vassals in subjection to them in a similar manner. A small part of the nation live independent, under the title of *oranicai* or *noble*, and sell their services to those who pay them best; while the body of the nation is composed of slaves, and live in perpetual servitude.

The generality of these people are restless, fond of navigation, war, plunder, emigrations, colonies, desperate enterprises, adventures, and gallantry. They talk incessantly of their honour and their bravery; whilst they are universally considered by those with whom they have intercourse, as the most treacherous, ferocious people on earth. This ferocity, which the Malays qualify under the name of *courage*, is so well

known to the European companies who have settlements in the Indies, that they have universally agreed in prohibiting the captains of their ships who may put into the Malay islands, from taking on board any seamen from that nation, except in the greatest distress, and then on no account to exceed two or three. It is not in the least uncommon for an handful of these horrid savages suddenly to embark, attack a vessel by surprise, massacre the people, and make themselves master of her. Malay batteaux, with 24 or 30 men, have been known to board European ships of 30 or 40 guns, in order to take possession of them, and murder with their poignards great part of the crew. Those who are not slaves go always armed: they would think themselves disgraced if they went abroad without their poignards, which they call *crit*. As their lives are a perpetual round of agitation and tumult, they cannot endure the long flowing garments in use among the other Asiatics. Their habits are exactly adapted to their shapes, and loaded with a multitude of buttons, which fasten them close to their bodies.

The country possessed by the Malays is in general very fertile. It abounds with odoriferous woods, such as the aloes, the sandal, and the Cassia. The ground is covered with flowers of the greatest fragrance, of which there is a perpetual succession throughout the year. There are abundance of mines of the most precious metals, said to be richer even than those of Brazil or Peru, and in some places are mines of diamonds. The sea also abounds with excellent fish, together with ambergris, pearls, and those delicate bird-nests so much in request in China, formed in the rocks with the spawn of fishes and the foam of the sea, by a species of small-sized swallow peculiar to those seas. These are of such an exquisite flavour, that the Chinese for a long time purchased them for their weight in gold, and still buy them at an excessive price. See *BIRDS-Nest*.

Notwithstanding all this plenty, however, the Malays are miserable. The culture of the lands, abandoned to slaves, is fallen into contempt. These wretched labourers, dragged incessantly from their rustic employments by their restless masters, who delight in war and maritime enterprises, have never time or resolution to give the necessary attention to the labouring of their grounds; of consequence the lands for the most part are uncultivated, and produce no kind of grain for the subsistence of the inhabitants. The sago tree indeed supplies in part the defect of grain. It is a species of the palm-tree, which grows naturally in the woods to the height of about 20 or 30 feet; its circumference being sometimes from five to six. Its ligneous bark is about an inch in thickness, and covers a multitude of long fibres, which being interwoven one with another envelope a mass of a gummy kind of meal. As soon as this tree is ripe, a whitish dust, which transpires through the pores of the leaves, and adheres to their extremities, indicates that the trees are in a state of maturity. The Malays then cut them down near the root, divide them into several sections, which they split into quarters: they then scoop out the mass of mealy substance, which is enveloped by and adheres to the fibres; they dilute it in pure water, and then pass it through a straining bag of fine cloth, in order to separate it from the fibres. When this paste has lost

Malacca.

Malacca
Ma aga.

part of its moisture by evaporation, the Malays throw it into a kind of earthen vessel of different shapes, where they allow it to dry and harden. Their paste is wholesome nourishing food, and preserves for many years.

MALACCA, the capital of the country of the same name, is situated in a flat country close to the sea. The walls and fortifications are founded on a solid rock, and are carried up to a great height; the lower part of them is washed by the sea at every tide, and on the land-side is a wide canal or ditch, cut from the sea to the river, which makes it an island. In 1641 it was taken from the Portuguese by the Dutch, since which time it has continued in their possession. In this city there are a great many broad streets; but they are very badly paved. The houses are tolerably well built, and some of them have gardens behind or on one side. The inhabitants consist of a few Dutch, many Malays, Moors, Chinese, and other Indians, who are kept in awe by a fortress, which is separated from the city by a river, and by good walls and bastions, as well as by strong gates, and a draw-bridge that is on the eastern side. The city is well situated for trade and navigation. E. Long. 102. 2. N. Lat. 2. 12.

MALACHI, or the prophecy of MALACHI, a canonical book of the Old Testament, and the last of the 12 lesser prophets. Malachi prophesied about 300 years before Christ, reproving the Jews for their wickedness after their return from Babylon, charging them with rebellion, sacrilege, adultery, profaneness, and infidelity; and condemning the priests for being scandalously careless in their ministry: at the same time not forgetting to encourage the pious few, who, in that corrupt age, maintained their integrity. This prophet distinctly points at the Messiah, who was suddenly to come to his temple, and to be introduced by Elijah the prophet, that is, by John the Baptist, who came in the spirit and power of Elias, or Elijah.

MALACIA, in medicine, is a languishing disorder incident to pregnant women, in which they long sometimes for one kind of food and sometimes for another, and eat it with extraordinary greediness.

MALACOPTERYGEUS, among ichthyologists, an appellation given to such fishes as have the rays of their fins bony, but not pointed or sharp at the extremities like those of acanthopterygeous fishes.

MALACOSTOMOUS FISHES, those destitute of teeth in the jaws, called in English *leather-mouthed*, as the tench, carp, bream, &c.

MALAGA, an ancient, rich, and strong town of Spain, in the kingdom of Grenada, with two castles, a bishop's see, and a good harbour, which renders it a place of considerable commerce. The advantage of this commerce, according to M. Bourgoanne, is entirely in favour of Spain, but almost without any to its navigation; of 842 vessels which arrived at this port in 1782, from almost every commercial nation, scarcely 100 were Spanish, even reckoning the ships of war which anchored there. The English, who are in possession of the greatest part of the trade, carry thither woollens and great quantities of small ware; the Dutch carry spice, cutlery ware, laces, ribbons, thread, &c. These nations, those of the north, and Italy, export to the amount of two millions and a

half of piaſtres in wines, fruits, ſumach, pickled anchovies, oil, &c. and all they carry thither amounts only to about a million and a half. The balance would be ſtill more advantageous for Malaga if the ſilk and wool of the kingdom of Grenada were exported from this port; but theſe are employed in the country where they are produced. The ſtreets of Malaga are narrow, but there are ſome good ſquares; and the cathedral church is a ſuperb building, ſaid to be as large as St Paul's. The only other building of note is the biſhop's palace; which is a large edifice, but looks inſignificant from its being ſituated near the other. Its prelate enjoys a revenue of L. 16,000 Sterling. Malaga is ſeated on the Mediterranean ſea, at the foot of a craggy mountain. E. Long. 4. 56. N. Lat. 6. 51.

MALAGRIDA (Gabriel), an Italian Jeſuit, was choſen by the general of the order to conduct miſſions into Portugal. To great eaſe and fluency of ſpeech, for which he was indebted to enthuſiaſm, he added the moſt ardent zeal for the intereſt of the ſociety to which he belonged. He ſoon became the fashionable director; and every one, ſmall or great, placed himſelf under his conduct. He was reſpected as a ſaint, and conſulted as an oracle. When a conſpiracy was formed by the duke d'Aveiro againſt the king of Portugal, it is aſſerted by the enemies of the ſociety, that three Jeſuits, among whom was Malagrida, were conſulted concerning the meaſure. They add (what is very improbable), that it was decided by theſe caſuiſts, that it was only a venial crime to kill a king who perſecuted the ſaints. At that time the king of Portugal, ſpurred on by a miniſter who had no favour for the Jeſuits, openly declared himſelf againſt them, and ſoon after baniſhed them from his kingdom. Only three of them were apprehended, Malagrida, Alexander, and Mathos, who were accuſed of having approved his murder. But either the trial could not be proceeded in without the conſent of the pope, which was not granted, or no proof could be got ſufficient to condemn Malagrida; and therefore the king was obliged to deliver him to the inquiſition, as being ſuſpected of having formerly advanced ſome raſh propoſitions which bordered on hereſy. Two publications which he acknowledged, and which give the full eſt indications of complete insanity, were the foundation of theſe ſuſpicions. The one was written in Latin, and intitled *Traſtatus de vita et imperio Antichriſti*; the other in Portuguese, under the title of the "Life of St Anne, compoſed with the aſſiſtance of the bleſſed Virgin Mary and her moſt holy Son." They are full of extravagance and abſurdity.—This enthuſiaſt pretended to have the gift of miracles. He confeſſed before the judges of the Inquiſition, that God himſelf had declared him his ambaffador, apoſtle, and prophet; that he was united to God by a perpetual union; and that the Virgin Mary, with the conſent of Jeſus Chriſt and of the whole Trinity, had declared him to be her ſon. In ſhort, he confeſſed, as is pretended, that he felt in the priſon, at the age of 72, ſome emotions very uncommon at that period of life, which at firſt gave him great uneaſineſs, but that it had been revealed to him by God that theſe emotions were only the natural effect of an involuntary agitation, wherein there was the ſame

Malden,
Malaleuca.

same merit as in prayer. It was for such extravagancies that this unfortunate wretch was condemned by the Inquisition: but his death was hastened by a vision which he eagerly revealed. Upon occasion of the death of the marquis de Tancourt, commander in chief of the province of Estremadura, mournful and continued discharges were made in honour of him by the castle of Lisbon, and by all the forts on the banks of the Tagus. These being heard by Malagrida in his dungeon, he instantly supposed, from their extraordinary nature, and from their happening during the night, that the king was dead. The next day he demanded an audience from the members of the Inquisition: which being granted, he told them that he had been ordered by God to show the minister of the holy office that he was not a hypocrite, as was pretended; for the king's death had been revealed to him, and he had seen in a vision the torments to which his majesty was condemned for having persecuted the religious of his order. This was sufficient to accelerate his punishment: he was burnt on the 21st of September 1761; not as the accomplice of a parricide, but as a false prophet, for which he deserved to be confined in bedlam rather than tied to the stake. The acts of impiety whereof he was accused were nothing more than extravagancies proceeding from a mistaken devotion and an overheated brain.

MALDEN, a town of Essex, 37 miles from London, situated on an eminence at the conflux of the Chelmer and Pant or Blackwater, where they enter the sea. It was the first Roman colony in Britain, and the seat of some of the old British kings. It was besieged, plundered, and burnt by queen Boadicea; but the Romans repaired it. It was again ruined by the Danes, but rebuilt by the Saxons. It is a populous corporation, governed by two bailiffs, six aldermen, 18 headboroughs or capital burgeses, a steward, recorder, and above 400 commonalty and burgeses, who have all a vote for its members of parliament. It has a convenient haven on an arm of the sea for vessels of 400 tons; and drives a good trade in coal, iron, corn, and deals. It formerly had three, now only two, parish-churches. Here is a large library for the use of the minister and the clergy of the neighbouring parishes, who generally reside here on account of the unwholesomeness of the air where their churches are. Here is a grammar-school, a small-church, school, and a workhouse where the poor weave sack-cloth. The custom of Borough English is kept up here. It has a market on Saturdays, and a fair on the 18th of September. A little beyond it begins Blackwater bay, famous for the Walfleet oysters. The channel called Malden-water is navigable to the town. King Edward the elder (of the Saxon race) resided here whilst he built Witham and Hertford castles. On the west side of the town are the remains of a camp.

MALALEUCA, the CAYPUTI TREE: A genus of the polyandria order, belonging to the polyadelphia class of plants. There is but one species, viz. the leucodendrum, a native of the East Indies and South-Sea islands. Mr Forster relates that leucodendrawere found in the island of New Caledonia: they were black at the root; but had a bark perfectly white and loose, with long narrow leaves like our willows. The leaves are extremely fragrant and aromatic; and Rumphius tells

us, that from them the natives of the Moluccas make the oil called *cayputi*. This oil is commended as a nervous medicine, and as being useful in some cardialgies. The dose is four or five drops in some convenient liquor.

MALDIVIA ISLANDS, a cluster of small islands in the Indian ocean, 500 miles south-west of the continent of the island of Ceylon. They are about 1000 in number, and are very small; extending from the second degree of south latitude to the seventh degree north latitude. They are generally black low lands, surrounded by rocks and sands. The natives are of the same complexion with the Arabians, profess the Mahometan religion, and are subject to one sovereign. The channels between the islands are very narrow, and some of them are fordable. They produce neither rice, corn, nor herbage; but the natives live upon coconuts, and other fruits, roots, and fish. They have little or nothing to barter with, unless the shells called *cowrys*, or *blackmore's teeth*, with which they abound; and these serve instead of small coin in many parts of India.

MALDONAT (John), a Spanish Jesuit born in 1534, was accused of heresy, and of procuring a fraudulent will in seducing the president de St Andre at Paris to bequeath his estate to the Jesuits. Peter Gondi acquitted him of the first charge, and the parliament of Paris of the other. He retired after these troubles to Bourges, but went to Rome by order of pope Gregory XIII. to take care of the publication of the Septuagint; and there, finishing his commentary on the gospels in 1582, he died in the beginning of the following year. He wrote, besides, Commentaries on Jeremiah, Baruch, Ezekiel, and Daniel; a treatise on the sacraments, on grace, on original sin; and several other pieces printed at Paris in 1677, in folio. His style is clear, lively, and easy. He does not servilely follow the scholastic divines; but is pretty free, and sometimes singular, in his sentiments.

MALE, among zoologists, that sex of animals which has the parts of generation situated externally. See SEX and GENERATION.

The term *male* has also, from some similitude to that sex in animals, been applied to several inanimate things; thus we say, a male flower, a male screw, &c. See *Mas Planta*, *MASCULUS Flos*, and *SCREW*; also *FEMALE* and *FLOS*.

MALEBRANCHE (Nicholas), an eminent French metaphysician, the son of Nicholas Malebranche, secretary to the French king, was born in 1638, and admitted into the congregation of the oratory in 1660. He at first applied himself to the study of languages and history: but afterwards meeting with Des Cartes's *Treatise of Man*, he gave himself up entirely to the study of philosophy. In 1699, he was admitted an honorary member of the Royal Academy of Sciences at Paris. Notwithstanding he was of a delicate constitution, he enjoyed a pretty good state of health till his death, which happened in 1715, at the age of 77. Father Malebranche read little, but thought a great deal. He despised that kind of philosophy which consists only in knowing the opinions of other men, since a person may know the history of other mens thoughts without thinking himself. He could never

Maldivia
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Male-
branche.

read

Male-
branche,
Malherbe

read ten verses together without disgust. He meditated with his windows shut, in order to keep out the light, which he found to be a disturbance to him. His conversation turned upon the same subjects as his books; but was mixed with so much modesty and deference to the judgment of others, that it was extremely and universally desired. His books are famous; particularly his *Recherche de la Verite*, i. e. "Search after truth:" his design in which is, to point to us the errors in which we are daily led by our senses, imagination, and passions; and to prescribe a method for discovering the truth, which he does, by starting the notion of seeing all things in God. And hence he is led to think and speak merely of human knowledge, either as it lies in written books, or in the book of nature, compared with that light which displays itself from the ideal world; and by attending to which, with pure and defecate minds, he supposes knowledge to be most easily had. The fineness of this author's sentiments, together with his fine manner of expressing them, made every body admire his genius and abilities; but he has generally passed for a visionary philosopher. Mr Locke, in his examination of Malebranche's opinion of seeing all things in God, styles him "an acute and ingenious author;" and tells us, that there are "a great many very fine thoughts, judicious reasonings, and uncommon reflections, in his *Recherche*." But Mr Locke, in that piece, endeavours to refute the chief principles of his system. He wrote many other pieces besides that we have mentioned, all tending some way or other to confirm his main system, established in the *Recherche*, and to clear it from the objections which were brought against it, or from the consequence which were deduced from it: and if he has not attained what he aimed at in these several productions, he has certainly shown great abilities and a vast force of genius.

MALHERBE (Francis de), the best French poet of his time, was born at Caen about the year 1556, of a noble and ancient family. He quitted Normandy at 17 years of age; and went into Provence, where he attached himself to the family of Henry Angouleme, the natural son of king Henry II. and was in the service of that prince till he was killed by Altoviti in 1586. At length cardinal de Perron, being informed of his merit and abilities, introduced him to Hen. IV. who took him into his service. After that monarch's death, queen Mary de Medicis settled a pension of 500 crowns upon our poet, who died at Paris in 1628. The best and most complete edition of his poetical works is that of 1666, with Menage's remarks. Malherbe so far excelled all the French poets who preceded him, that Boileau considers him as the father of French poetry; but he composed with great difficulty, and put his mind on the rack in correcting what he wrote. He was a man of a singular humour, blunt in his behaviour, and without religion. When the poor used to promise him, that they would pray to God for him, he answered them, that "he did not believe they could have any great interest in heaven, since they were left in such a bad condition upon earth; and that he should be better pleased if the duke de Luynes, or some other favourite, had made him the same promise." He would often say that "the religion of gentlemen was that of their prince." During his last sickness

N^o 192.

he had much ado to resolve to confess to a priest; for which he gave this facetious reason, that "he never used to confess but at Easter." And some few moments before his death, when he had been in a lethargy two hours, he awaked on a sudden to reprove his landlady, who waited on him, for using a word that was not good French; saying to his confessor, who reprimanded him for it, that "he could not help it, and he would defend the purity of the French language to the last moment of his life."

MALICE, in ethics and law, is a formed design of doing mischief to another; it differs from hatred. In murder, it is malice makes the crime; and if a man, having a malicious intent to kill another, in the execution of his malice kills a person not intended, the malice shall be connected to his person, and he shall be adjudged a murderer. The word *ex malitia præcogitata* are necessary to an indictment of murder, &c. And this *malitia præcogitata*, or *malice præpense*, may be either express or implied in law. Express malice is, when one, with a sedate, deliberate mind, and formed design, kills another; which formed design is evidenced by external circumstances discovering that intention; as lying in wait, antecedent menaces, former grudges, and concerted schemes to do him some bodily harm. Besides, where no malice is expressed, the law will imply it; as where a man willfully poisons another, in such a deliberate act the law presumes malice, though no particular enmity can be proved. And if a man kills another suddenly, without any, or without a considerable provocation, the law implies malice; for no person, unless of an abandoned heart, would be guilty of such an act upon a slight or no apparent cause.

MALIGNANT, among physicians, a term applied to diseases of a very dangerous nature, and generally infectious; such are the dysentery, hospital-fever, &c. in their worst stages.

Malignity among physicians signifies much the same with contagion. See CONTAGION.

MALL, SEA-MALL, or *Sea-mew*, in ornithology. See LARUS.

MALLARD, in ornithology. See ANAS.

MALLEABLE, a property of metals whereby they are capable of being extended under the hammer.

MALLENDERS, in farriery. See there § xxxiv.

MALLEOLI, in the ancient art of war, were bundles of combustible materials, set on fire to give light in the night, or to annoy the enemy; when they were employed for the latter purpose they were shot out of a bow, or fixed to a javelin, and thus thrown into the enemies engines, ships, &c. in order to burn them. Pitch was always a principal ingredient in the composition. The malleoli had also the name of *pyroboli*.

MALLET or MALLOCH, (David) an English poet, but a Scotsman by birth, was born in that country about 1700. By the penury of his parents, he was compelled to be janitor of the high school at Edinburgh; but he surmounted the disadvantages of his birth and fortune; for when the Duke of Montrose applied to the college of Edinburgh for a tutor to educate his sons, Malloch was recommended. When his pupils went abroad, they were entrusted to his

Malice,
Mallet.

Mallet. his care; and having conducted them through their travels, he returned with them to London. Here, residing in their family, he naturally gained admission to persons of high rank and character, and began to give specimens of his poetical talents. In 1733, he published a poem on Verbal Criticism, on purpose to make his court to Pope. In 1740, he wrote a Life of Lord Bacon, which was then prefixed to an edition of his works; but with so much more knowledge of history than of science, that, when he afterwards undertook the Life of Marlborough, some were apprehensive lest he should forget that Marlborough was a general, as he had forgotten that Bacon was a philosopher. The old duchess of Marlborough assigned in her will this task to Glover and Mallet, with a reward of 1000 l. and a prohibition to insert any verses. Glover is supposed to have rejected the legacy with disdain, so that the work devolved upon Mallet; who had also a pension from the late duke of Marlborough to promote his industry, and who was continually talking of the discoveries he made, but left not when he died any historical labours behind him. When the prince of Wales was driven from the palace, and kept a separate court by way of opposition, to increase his popularity by patronizing literature, he made Mallet his under-secretary, with a salary of 200 l. a year.—Thomson likewise had a pension; and they were associated in the composition of the Masque of Alfred, which in its original state was played at Cliefden in 1740. It was afterwards almost wholly changed by Mallet, and brought upon the stage of Drury Lane in 1751, but with no great success. He had before published two tragedies; Eurydice, acted at Drury Lane in 1731; and Mustapha, acted at the same theatre in 1739. It was dedicated to the prince his master, and was well received, but never was revived. His next work was Amyntor and Theodora (1747), a long story in blank verse; in which there is copiousness and elegance of language, vigour of sentiment, and imagery well adapted to take possession of the fancy. In 1753, his masque of Britannia was acted at Drury Lane, and his tragedy of Elvira in 1763; in which year he was appointed keeper of the book of entries for ships in the port of London. In the beginning of the last war, when the nation was exasperated by ill success, he was employed to turn the public vengeance upon Byng, and wrote a letter of accusation under the character of a Plain Man. The paper was with great industry circulated and dispersed; and he for his seasonable intervention had a considerable pension bestowed upon him, which he retained to his death. Towards the end of his life he went with his wife to France; but after a while, finding his health declining, he returned alone to England, and died in April 1765. He was twice married, and by his first wife had several children. One daughter, who married an Italian of rank named Cilefia, wrote a tragedy called Almida, which was acted at Drury Lane. His second wife was the daughter of a nobleman's steward, who had a considerable fortune, which she took care to retain in her own hands. His stature was diminutive, but he was regularly formed; his appearance, till he grew corpulent, was agreeable, and he suffered it to want no recommendation that

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dress could give it. His conversation was elegant and easy.

MALLET (Edme) was born at Melun in 1713, and enjoyed a curacy in the neighbourhood of his native place till 1751, when he went to Paris to be professor of theology in the college of Navarre, of which he was admitted a doctor. Boyer, the late bishop of Mirepoix, was at first much prejudiced against him; but being afterwards undeceived, he conferred upon him the see of Verdun as a reward for his doctrine and morals. Jansenism had been imputed to him by his enemies with this prelate; and the Gazette which went by the name of *Ecclesiastical*, accused him of impiety. Either of these imputations was equally undeserved by the Abbé Mallet: as a Christian, he was grieved at the disputes of the French Church; and, as a philosopher, he was astonished that the government had not, from the very beginning of those dissensions imposed silence on both parties. He died at Paris in 1755, at the age of 42. The principal of his works are, 1. *Principes pour la lecture des Poètes*, 1745, 12mo. 2 vols. 2. *Essai sur l'Etude des Belles-Lettres*, 1747, 12mo. 3. *Essai sur les bienséances oratoires*, 1753, 12mo. 4. *Principes pour la lecture des Orateurs*, 1753, 12mo. 3 vols. 5. *Histoire des Guerres civiles de France sous les regnes de Francois II. Charles IX. Henri III. & Henry IV.* translated from the Italian of d'Avila.—In Mallet's works on the Poets, Orators, and the Belles Lettres, his object is no more than to explain with accuracy and precision the rules of the great masters, and to support them by examples from authors ancient and modern. The style of his different writings, to which his mind bore a great resemblance, was neat, easy, and unaffected. But what must render his memory estimable, was his attachment to his friends, his candour, moderation, gentleness, and modesty. He was employed to write the theological and belles-lettres articles in the *Encyclopédie*; and whatever he wrote in that dictionary was in general well composed. Abbé Mallet was preparing two important works when the world was deprived of him by death. The first was *Une Histoire generale de nos Guerres depuis le commencement de la Monarchie*; the second, *Une Histoire du Concile de Trente*, which he intended to set in opposition to that of Father Paul translated by Father le Courayer.

MALLET, a large kind of hammer made of wood; much used by artificers who work with a chissel, as sculptors, masons, and stone-cutters, whose mallet is ordinarily round; and by carpenters, joiners; &c. who use it square. There are several sorts of mallets used for different purposes on ship-board. The calking mallet is chiefly employed to drive the oakum into the seams of a ship, where the edges of the planks are joined to each other in the sides, deck, or bottom. The head of this mallet is long and cylindrical, being hooped with iron to prevent it from splitting in the exercise of calking. There is also the serving mallet, used in serving the rigging, by binding the spun-yarn more firmly about it than could possibly be done by hand, which is performed in the following manner: the spun-yarn being previously rolled up in a large ball or clue, two or three turns of it are passed about the rope, and about the body of the mallet, which for

this

^{Malleville} Mallicollo. this purpose is furnished with a round channel in its surface, that conforms to the convexity of the rope intended to be served. The turns of the spun-yarn being strained round the mallet, so as to confine it firmly to the rope, which is extended above the deck, one man passes the ball continually about the rope, whilst the other, at the same time, winds on the spun-yarn by means of the mallet, whose handle acting as a lever strainsevery turnabout the rope as firm as possible.

MALLEVILLE (Claud de), a French poet, born at Paris, was one of the first members of the French academy, and gained a prize from Voiture and other ingenious men. He became secretary to M. de Bassompierre, to whom he performed important services while he was in prison; and with the rewards he received for them he purchased the place of secretary to the king. He was likewise secretary to the French academy, and died in 1647. He wrote sonnets, stanzas, elegies, epigrams, songs, madrigals, and a paraphrase on some of the Psalms. His sonnets are most esteemed.

MALLICOLLO, one of the new Hebrides islands in the south-sea, and the most considerable of them all next to *Espiritu Santo*. It is 18 leagues long from south-east to north-west; its greatest breadth, which is at the south-east end, is eight leagues; the north-west end is two-thirds its breadth, and narrower in the middle one-third. This contraction is occasioned by a wide and deep bay on the south-west side. It appears to be very fertile, and well inhabited; the land on the sea coast is rather low, and lies with a greater slope from the hills which are in the middle of the island; lat. 16 deg. 28. min. south; 167 deg. 56 min. east. On inquiring of the natives the name of this island, they were answered that it was Mallicollo, which has a near resemblance to Manicollo, the name which Quiros received for it 160 years before. He did not indeed visit the island, but had his intelligence from the natives.

The south coast, which was most attentively examined by captain Cook, is luxuriantly clothed with wood and other vegetables, from the sea-shore to the very summits of the hills. To the north-west, the country is less woody, but more agreeably intersected by lawns, some of which appeared to be cultivated. The vegetable productions of this country seemed to be in great variety; cocoa nuts, bread-fruit, bananas, sugar-canes, yams, eddoes, and turmeric: but captain Cook thought the fruits here not so good as at the Society and Friendly Isles. Hogs, and common poultry, are their domestic animals; and as the frequent squeaking of pigs was heard in the woods, it was concluded that the former are in considerable numbers here. A brace of Tahitian puppies was given them, with a view to stock the country with that species of animal: these they received with strong signs of satisfaction. The woods appeared to be inhabited by many species of birds. Here was caught a shark, which measured nine feet in length, on which the ship's company feasted with great relish: this shark, when cut open, was found to have the bony point of an arrow sticking in its head, having been shot quite through the skull. The wound was healed so perfectly, that not the smallest vestige of it appeared on the outside:

a piece of the wood still remained sticking to the bony point, as well as a few fibres with which it had been tied on; but both the wood and the fibres were so rotted, as to crumble into dust at the touch. Two large reddish fish of the sea-bream kind were likewise caught, on which most of the officers and some of the petty officers dined the next day. The night following every one who had eaten of them was seized with violent pains in the head and bones, attended with a scorching heat all over the skin, and numbness in the joints; even such hogs and dogs as had partaken of these fish gave strong symptoms of being poisoned: one hog, who had eaten of the garbage, swelled to a great size, and died at night: several dogs were affected in the same manner; they groaned most piteously, had violent reachings, and could hardly drag their limbs along. These fish were supposed to have been of the same sort with those which Quiros mentions to have produced similar effects on board his ship, and which he calls *pargos*, which is the Spanish name for the sea-bream. Perhaps these fish are not always poisonous; but, like many species in the West and East Indies, may acquire that quality by feeding on poisonous vegetables: which conclusion is supported by the circumstance of the intestines having been found to be more poisonous than the rest. The effects of this poison on the officers continued for near a fortnight, during which time their pains returned every night, their teeth were loose, and their gums and palate excoriated.

The natives of Mallicollo are described as the most ugly, ill-proportioned people imaginable, and in every respect different from the other islanders in the South-Sea: they are of a very dark colour, and diminutive size; with long heads, flat faces, and monkey countenances; their hair, in general, black or brown, short and curly, but not quite so soft and woolly as that of a negro. Their beards are very strong, crisp, and bushy, and generally black and short. But what serves greatly to increase their natural deformity is a custom which they have of wearing a belt, or cord, round their waist: this rope is as thick as a man's finger; and is tied so tight round their belly, that it would be fatal to a person unaccustomed from infancy to such an unnatural ligature; for it cuts such a deep notch across the navel, that the belly seems in a manner divided, one part being above and the other below the rope. The men go quite naked, except a piece of cloth or leaf used as a wrapper. Most other nations invent some kind of covering from motives of shame; but here a roll of cloth, continually fastened to the belt, rather displays than conceals, and is the opposite of modesty. Besides having the flat broad nose and projecting cheek-bones of a negro, and a very short forehead, many increased their natural ugliness by painting their faces and breasts with a black colour. Some few had a small cap on the head made of matted-work. They wear bracelets of white and black shells, which press the upper arm so closely, that they seem to have been put on when the wearer was very young: this tends, as well as the belt, to reduce the Mallicollese to that slender shape which characterises them. The depression of their foreheads is supposed to be artificial, as the heads of infants may be squeezed into any kind of form.

Mallicollo.

The first natives that were seen carried clubs in their hands, and waded into the water, carrying green boughs, the universal sign of peace. In a day's time they ventured to come within a few yards of the ship's boat, which was sent out; when they dipped their hands into the sea, and gathering some water in their palms, poured it on their heads. The officers in the boat, in compliance with their example, did the same, with which the Indians appeared to be much pleased. They repeated the word *tomarr*, or *tomarro*, continually; which seemed to be an expression among them equivalent to *tayo* among the Society-Islands. The greater part were now armed with bows and arrows, and a few with spears. At length they ventured near the ship, and received a few presents of Taheitian cloth, which they eagerly accepted, and handed up their arrows in exchange, some of which were pointed with wood and some with bone, and daubed with a black gummy stuff which was supposed to be poisoned; but its effects were tried on a dog, without producing any dangerous symptoms. They continued about the ship, talking with great vociferation, but at the same time in such a good-humoured manner as was very entertaining. On looking steadfastly at one of them, he began to chatter with great fluency, and "grinned horribly a ghastly smile." Some continued about the ship till midnight; finding, however, at length, that they were but little noticed, for the captain wanted to get rid of them, they returned on shore, where the sound of singing and beating their drums was heard all night. Mr Forster supposes there may be 50,000 inhabitants on this extensive island, which contains more than 600 square miles. "We ought (says he) to figure to ourselves this country as one extensive forest; they have only begun to clear and plant a few insulated spots, which are lost in it like small islands in the Pacific Ocean." Perhaps, if we could ever penetrate through the darkness which involves the history of this nation, we might find that they have arrived in the South-Sea much later than the natives of the Friendly and Society Islands: so much at least is certain, that the latter appear to be a race totally distinct from the former; their form, their language, and their manners, strongly mark this difference. The natives, on some parts of New-Guinea and Papua, seem to correspond, in many particulars, with what has been observed of the Mallicollese. They differ likewise very widely from the light-coloured inhabitants of the South-Sea, by keeping their bodies entirely free of punctures. Whatever these people saw, they coveted; but they never repined at a refusal. The looking-glasses which were given them were highly esteemed, and they took great pleasure in viewing themselves; so that these ugly people seemed to have more conceit than the beautiful nation at O-Taheitee and the Society Islands. Early the next morning the natives came off to the ship in their canoes, and four or five of them went on board without any arms. They soon became familiar, and, with the greatest ease, climbed up the shrouds to the mast-head; when they came down, the captain took them into his cabin, and gave them medals, ribbons, nails, and pieces of red baize. They appeared the most intelligent of any nation that had been seen in the South-Sea: they readily understood the meaning con-

veyed by signs and gestures; and in a few minutes Mallicollo. taught the gentlemen of the ship several words in their language, which appeared to be wholly distinct from that general language of which so many dialects are spoken at the Society-Islands, the Marquesas, Friendly-Isles, Easter-Island, and New-Zeeland. Their language was not difficult to pronounce, but contained more consonants than any of them. Mr Forster, and some of the gentlemen from the ship, went on shore, and conversed with the natives, who with great goodwill sat down on the stump of a tree to teach them their language. They were surprised at the readiness of their guests to remember, and seemed to spend some time in pondering how it was possible to preserve the sound by such means as pencils and paper. They were not only assiduous in teaching; but had curiosity enough to learn the language of the strangers, which they pronounced with such accuracy as led their instructors to admire their extensive faculties and quick apprehension. Observing their organs of speech to be so flexible, they tried the most difficult sounds in the European languages, and had recourse to the compound Russian *shch*, all of which they pronounced at the first hearing without the least difficulty. They presently learned the English numerals, which they repeated rapidly on their fingers; so that what they wanted in personal beauty was amply compensated to them in acuteness of understanding. They express their admiration by hissing like a goose.

Their music is not remarkable either for harmony or variety, but seemed to be of a more lively turn than that at the Friendly-islands. Their behaviour to their visitants was, in general, harmless, but cautious: they gave them no invitation to stay among them; for they seemed not to relish the proximity of such powerful people, being probably accustomed to acts of violence and outrage from their neighbours. "In some of their countenances (says Mr Forster), we thought we could trace a mischievous, ill-natured disposition; but we might mistake jealousy for hatred."

Very few women were seen, but those few were no less ugly than the men: they were of small stature, and their heads, faces, and shoulders, were painted red. Those who were grown up, and probably married, had short pieces of a kind of cloth, or rather matting, round their waists, reaching nearly to their knees; the rest had only a string round the middle, with a wisp of straw; and the younger ones, from infancy to the age of 10 years, went stark naked, like the boys of the same age. The women were not observed to have any finery in their ears or round their necks and arms, it being fashionable in this island for the men only to adorn themselves; and wherever this custom prevails, the other sex is commonly oppressed, despised, and in a state of servility. Here the women were seen with bundles on their backs, which contained their children; the men seemed to have no kind of regard for them. None of them came off to the ship, and they generally kept at a distance when any party landed from the boat. They perforate the cartilage of the nose between the nostrils; and thrust therein a piece of white stone about an inch and a half long, which is bent like the curvature of a bow. The houses here are, like those of the other isles, rather low, and covered with a palm-thatch.

Mallicollo. thatch. Some were inclosed or walled round with boards, and the entrance to these was by a square hole at one end.

Their weapons are bows and arrows, and a club about two feet and a half in length, made of the cauarina wood, commonly knobbed at one end, and well polished. This weapon they hang on their right shoulder, from a thick rope made of a kind of grass. It appeared to be preserved for close engagements, after having emptied the quiver. On the left wrist they wear a circular wooden plate, neatly covered, and joined with straw, about five inches in diameter, upon which they break the violence of the recoiling bow-string, and preserve their arm unhurt. Their arrows are made of a sort of reed; and are sometimes armed with a long sharp point made of the red-wood, and sometimes with a very hard point made of bone: and these points are all covered with a substance which was supposed to be poisoned. Indeed the people themselves confirmed these suppositions, by making signs to the gentlemen of the ship not to touch the point, and giving them to understand that if they were pricked by them they would die: they are very careful of them themselves, and keep them always wrapt up in a quiver. Some of these arrows are armed with two or three points each, with small prickles on the edge to prevent the arrow from being drawn out of the wound. Repeated and effectual trials of the virulence of this poison were made upon dogs, but they gave no signs of being hurt by it.

Their food seems to be principally vegetables, since they apply themselves to husbandry. As hogs and fowls are bred here, the natives, doubtless, feast sometimes on pork and poultry; and as they have canoes, it may be supposed that they draw a part of their subsistence from the ocean. The greatest number of canoes that were seen along-side the ship at one time did not exceed 10, or, according to Mr Forster, 14, and no more than four or five people in each: they were small, of indifferent workmanship, and without ornament; but provided with an outrigger.

After some slight indications of a hostile intention on the part of the natives, which they had shown in their canoes whilst about the ship, captain Cook, with a party of marines in two boats, landed in the face of 400 or 500 Indians who were assembled on the shore. Tho' they were all armed with bows and arrows, clubs and spears, they made not the least opposition; on the contrary, seeing the captain advance alone, unarmed, with only a green branch in his hand, one of them, who seemed to be a chief, giving his bow and arrows to another, met him in the water, bearing also a green branch. When they met, the branches were exchanged; and the chief led the captain by the hand up to the crowd, to whom he immediately distributed presents: in the mean time the marines were landed, and drawn up upon the beach. The captain then made signs that he wanted wood, and they by signs gave him permission to cut down the trees. A small pig was presently brought, and presented to the captain, who in return gave the bearer a piece of cloth. It was expected from this instance, that an exchange of provisions for various articles of merchandise would take place: but these expectations proved fallacious; no

more pigs were procured, and only about half a dozen. Mallow, cocoa-nuts, and a small quantity of fresh water. As Malmesbury these islanders were possessed of hogs as well as fowls, their backwardness to part with either might be owing to the little estimation in which they held such articles as were tendered in barter; for they set no value on any nails, or any other kind of iron-tools, and held all the gew-gaws of finery equally cheap. They would now and then exchange an arrow for a piece of cloth, but very seldom would part with a bow. After sending on board what wood had been cut, the party all embarked, and the natives dispersed. When the ship was about to leave this island, captain Cook gives the following relation: "When the natives saw us under sail, they came off in canoes, making exchanges with more confidence than before, and giving such extraordinary proofs of their honesty as surprised us. As the ship at first had fresh way thro' the water, several of the canoes dropped astern after they had received goods, and before they had time to deliver theirs in return: instead of taking advantage of this, as our friends at the Society-islands would have done, they used their utmost efforts to get up with us, and deliver what they had already been paid for. One man in particular followed us a considerable time, and did not reach us till it was calm, and the thing was forgotten. As soon as he came along-side, he held up the article, which several on board were ready to buy: but he refused to part with it till he saw the person to whom he had before sold it; and to him he gave it. The person not knowing the man again, offered him something in return, which he refused; and showing him what had been given before, at length made him sensible of the nice sense of honour which had actuated this Indian."

MALLOW, a manor, and also a borough town in the county of Cork, and province of Munster in Ireland, above 118 miles from Dublin. It was incorporated by charter in 1688, and sends two members to parliament. It is pleasantly situated on the north bank of the Blackwater, over which there is an excellent stone-bridge. Here is also a good church, a market house, and barracks for a troop of horse. Not far distant is a fine spring of a moderately tepid water, which bursts out of the bottom of a fine limestone rock, and approaches the nearest in all its qualities to the hot-well waters of Bristol of any that has been yet discovered in this kingdom, which brings a resort of good company there frequently in the summer months, and has caused it to be called the *Irish Bath*. Mallow is a post town, and has five fairs.

MALLOW, in botany. See MALVA.

Marsh-MALLOW. See ALTHÆA.

Indian-MALLOW. See SIDA.

MALMSBURY, a town of Wiltshire, in England, 95 miles from London. It stands on a hill, with six bridges over the river Avon at the bottom; with which, and a brook that runs into it, it is in a manner encompassed. It formerly had walls and a castle, which were pulled down to enlarge the abbey, which was the biggest in Wiltshire, and its abbots sat in parliament. The Saxon King Athelstan granted the town large immunities, and was buried under the high altar of the church, and his monument still remains in the nave

Malmesbury of it. The memory of Aldhelm, its first abbot, who was the king's great favourite, and whom he got to be canonized after his death, is still kept up by a meadow near this town, called Aldhelm's Mead. By charter of King William III. the corporation consists of an alderman, who is chosen yearly, 12 capital burgesses, and 4 assistants, land-holders and commoners. Here is an alms-house for 4 men and 4 women, and near the bridge an hospital for lepers, where it is supposed there was formerly a nunnery. This town drives a considerable trade in the woollen manufactory; has a market on Saturday, and three fairs. It has sent members to parliament ever since the 26th of Edward I.

William of MALMSBURY. See WILLIAM.

MALO (St) a sea-port town of France, in the province of Brittany, situated in the latitude of 48 degrees 38 minutes north, and 1 degree 57 minutes to the west. The town stands upon a rock called the island of St Aaron, surrounded by the sea at high water, which is now joined to the continent, by means of a sort of causey or dike, near a mile long, called the Sillon, which has been often damaged by storms, and was almost quite ruined in the year 1730. At the end of this causey next the town is a castle, flanked with large towers, a good ditch, and a large bastion. The city nearly covers the whole surface of the island, and is of an oblong form, surrounded with a strong rampart, on which there is a number of cannon.—There is always in it a good garrison. The cathedral-church is dedicated to St Vincent, and stands in the square of the same name, as do also the town-house and the episcopal palace. There are some other squares in the place, but less remarkable; and as to the streets, except two or three, they are all very narrow. There being no springs of fresh water in St Malo, the inhabitants are at great pains to convey the rain which falls on the roofs of their houses into cisterns; and of this they have enough for all family-uses. There is only one parish-church in the town, though it contains between 9000 and 10,000 inhabitants; but there are several convents of monks and nuns, and a general hospital. The two entrances into the harbour are defended by several forts, such as that of the Conchal; of the great and the little bay; the forts of Isle-Recours, Sezembre, Roteneuf; the castle of Latte, and Fort-Royal. These are several little isles near the harbour, the most considerable whereof is that of St Sezembre, which is near a quarter of a league in circumference, and serve as so many outworks to the fortifications of the city, and are useful as bulwarks, by breaking the violence of the waves, which otherwise would beat with great force against the walls of the city. At the end of the causey next the continent stands the suburb of St Servant, large and well built. Here the merchants have their houses and store-houses. Here is the dock-yard; and a secure harbour is formed by the river Rance, where ships of great burden can ride at anchor very near the houses. The harbour is one of the best in the kingdom, and most frequented by merchant-ships; but it is of very difficult and dangerous access on account of the rocks which lie round it. The town of St Malo is exceedingly well situated for trade; and accordingly, in this respect, it has succeeded beyond most towns in France. It main-

tains a trade with England, Holland, and Spain.—The commerce of Spain is of all the most considerable, and most profitable to the inhabitants of St Malo, the ships of the Malouins being frequently employed as register ships by the Spaniards, to carry out the rich cargoes to Peru and Mexico, and bring home treasure and plate from America. The inhabitants of St Malo carry on also a considerable trade in dry and salted cod to Newfoundland. They send to this fishery a good many vessels from 100 to 300 tons burden, with salt for the fish, and provisions for subsisting the crews. They carry their fish to Italy, Spain, and some to Bourdeaux and Bayonne, and bring home the returns in fruits, soap, oil, &c. which are disposed of to great advantage at Nantz. St Malo is the capital of the bishopric of that name, which is of considerable extent; and the soil about it produces most kinds of grain and fruits in great abundance. The most remarkable towns in the district and diocese of St Malo, are St Servant, Cancele, Chateaucuf, Dinan, Tintiniac, Combours, Montfort, Bréal, Guer, Ploermel, Joffelin, &c.

MALO, MACLOU, or Mabout, (Saint), the son of a gentleman in Great Britain, and cousin to St Magloire, was educated in a monastery in Ireland, and afterwards chosen bishop of Gui-Castel, a dignity which his humility prevented him from accepting. The people wishing to compel him, he went into Brittany, and put himself under the direction of a holy anchorite called Aaron, in the neighbourhood of Aleth. Some time after, about the year 541, he was chosen bishop of that city, and there cultivated piety and religion with great success. He afterwards retired to a solitude near Xaintes, where he died November 15. 565. From him the city of St Malo derives its name; his body having been carried thither, after the reduction of Aleth to a small village called *Guidalet* or *Guichalet*, and the transference of the episcopal see to St Malo.

MALOUIN (Paul-Jaques), born at Caen in 1701, was professor of medicine in the royal college of Paris, physician in ordinary to the queen, and a member of the Royal Society of London, and of the Academy of Sciences of Paris. These stations were a proper reward for his very extensive information in medicine and chemistry; and his amiable and steady character procured him many friends and protectors. He was very unlike some modern physicians, who put little trust in medicine; and was greatly displeased to hear any ill spoken of his profession. He observed one day to a young man who took this liberty, that all great men had respected medicine: *Ab!* said the young fellow, *you must at least except from the list one Moliere.* But then, instantly replied the doctor, *you see he is dead.* He is said to have believed the certainty of his art as firmly as a mathematician does that of geometry. Having prescribed a great many medicines for a celebrated man of letters, who followed his directions exactly, and was cured, Malouin eagerly embraced him, saying, *You deserve to be sick.* As he valued the rules of medicine still more on his own account than on that of others, he observed, especially in the latter part of his life, a very austere regimen. He strictly practised the preservative part of medicine, which is much more certain in its effects than the restorative. To this regi-

Malo, Malouins

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Malouin
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Malpighi

men Malouin was indebted, for what many philosophers have desired in vain, a healthy old age and an easy death. He was a stranger to the infirmities of age; and died at Paris of an apoplexy, the 3d of January 1778, in the 77th year of his age. By his will he left a legacy to the faculty of medicine, upon condition of their holding a public meeting every year for the purpose of giving the public an account of his labours and discoveries. Malouin was economical, but at the same time very disinterested. After two years of very lucrative practice, he left Paris and went to Versailles, where he saw very few patients, observing that he had *retired to the court*. His principal works are, 1. *Traite de Chimie*, 1734, 12mo. 2. *Chimie medicinale*, 2 vols 12mo, 1755; a book full of curious observations, and written in a chaste and well adapted style. He had the character of a laborious chemist; and he was a well informed and even a distinguished one for the age in which he lived: but his knowledge of chemistry, it must be confessed, was very imperfect, compared with the state of the science in the present age, in which it has assumed a new face, that probably will not be the last. 3. Some of the Arts in the Collection published by the academy of sciences on the arts and professions. A circumstance which happened at a meeting of the academy does as much honour to his heart, as any of his works do to his understanding. A new treatise on the art of baking, wherein some of Malouin's ideas were combated, was read by M. Parmentier before his fellows, among whom was the old doctor. The young academician, who knew how easily self-love is hurt, was afraid to meet his looks: but no sooner was the reading finished, than Malouin went up to him, and embracing him, "Receive my respects (said he), you have seen farther into the subject than I did." 4. He was likewise the author of the chemical articles in the *Encyclopedie*.

Of the same family was *Charles MALOUIN*, who graduated as a doctor of medicine in the university of Caen, and died in 1718 in the flower of his age. He published a *Treatise on Solids and Fluids*, Paris 1718, 12mo.

MALPAS, a town of Cheshire, 166 miles from London. It stands on a high hill, not far from the river Dee, on the borders of Shropshire; has a grammar-school, and an hospital, and had formerly a castle. It is called in Latin *Mala Platea*, i. e. "Ill Street," and was, for the same reason, by the Normans, called *Mal Pas*; but its three streets, of which it chiefly consists, are now well paved; and here is a benefice rich enough to support two rectors, who officiate alternately in its stately church. It has a good market on Mondays, and three fairs in the year.

MALPIGHI (Marcellus), an eminent Italian physician and anatomist in the 17th century. He studied under Massari and Mariano. The duke of Tuscany invited him to Pisa, to be professor of physic there. In this city he contracted an intimate acquaintance with Borelli, to whom he ascribed all the discoveries he had made. He went back to Bologna, the air of Pisa not agreeing with him. Cardinal Antonio Pignatelli, who had known him while he was legate at Bologna, being chosen pope in 1691, under the name of *Innocent XII.* immediately sent for him to Rome, and ap-

pointed him his physician. But this did not hinder him from pursuing his studies, and perfecting his works, which have immortalized his memory. He died in 1694; and his works, with his life written by himself prefixed, were first collected and printed at London, in folio, in 1667.

MALPIGHIA, BARBADOES CHERRY. a genus of the trigynia order, belonging to the decandria class of plants; and in the natural method ranking under the 23d order, *Trihilata*. The calyx is pentaphyllous, with melliferous pores on the outside at the base. There are five petals, roundish, and unguiculated: the berry unilocular, and trispermous. There are eight or ten species, all of them shrubby evergreens of the warm parts of America, rising with branchy stems from 8 or 10 to 15 or 20 feet high, ornamented with oval and lanceolate entire leaves, and large pentapetalous flowers, succeeded by red, cherry-shaped, eatable berries, of an acid and palatable flavour; and which, in the West Indies, where they grow naturally, are used instead of cherries. Three of the species are reared in our gardens, and make a fine variety in the stove. They retain their leaves all the year round; and begin to flower about the end of autumn, continuing in constant succession till the spring; after which they frequently produce and ripen their fruit, which commonly equals the size of a small cherry. The flowers are of a pale-red or purple colour. These plants are propagated by seed, which must be sown in spring, in pots of rich earth: then plunge them in a hot-bed; and when the plants are three or four inches high, prick them in separate small pots, give water, and plunge them in the bark-bed of the stove; where after they have remained a year or two, they may be placed in any part of it. They may even be placed in the open air during a month or two of the hottest weather in summer; but must be carefully supplied with water during the whole year.

MALPLAQUET, a village of the Netherlands, in Hainault, famous for a most bloody battle fought here on the 11th of September 1709, between the French under old marshal Villars, and the allies commanded by prince Eugene and the duke of Marlborough. The French army amounted to 120,000 men; and were posted behind the woods of La Marte and Taniers, in the neighbourhood of Malplaquet. They had fortified their situation in such a manner with lines, hedges, and trees laid across, that they seemed to be quite inaccessible. In this situation they expected certain victory; and even the common soldiers were so eager to engage, that they flung away the bread which had been just given them, though they had taken no sustenance for a whole day before. The allied army began the attack early in the morning, being favoured by a thick fog. The chief fury of their impression was made upon the left of the enemy; and with such success, that, notwithstanding their lines and barricadoes, the French were in less than an hour driven from their entrenchments. But on the enemy's right the combat was sustained with much greater obstinacy. The Dutch, who carried on the attack, drove them from their first line; but were repulsed from the second with great slaughter. The prince of Orange, who headed that attack, persisted in his efforts with incredible perseverance

Malt. feverance and intrepidity, though two horses had been killed under him, and the greater part of his officers slain and disabled. At last, however, the French were obliged to yield up the field of battle; but not till after having sold a dear-bought victory. Villars being dangerously wounded, they made an excellent retreat under the conduct of Boufflers, and took post near Guesnoy and Valenciennes. The conquerors took possession of the field of battle, on which above 20,000 of their best troops lay dead. The loss of the French, it is said, did not exceed 8000; and marshal Villars confidently asserted, that, if he had not been disabled, he would have gained an undoubted victory.

MALT denotes barley cured, or prepared to fit it for making a potable liquor, under a denomination of *beer* or *ale*. See BREWING.

MALT-Liquors have different names as well as different virtues, properties, and uses, both from the different manners of preparing the malt; whence they are distinguished into *pale* and *brown*; and from the different manners of preparing or brewing the liquors themselves; whence they are divided into *beer* and *ale*, *strong* and *small*, *new* and *old*.

Malt drinks are either pale or brown, as the malt is more or less dried on the kiln; that which is the slenderest dried tinging the liquor least in brewing, and therefore being called *pale*; whereas that higher dried, and as it were roasted, makes it of a higher colour. A mixture of both these makes an amber colour; whence several of these liquors take their name.

Now, it is certain, the pale malt has most of the natural grain in it, and is therefore the most nourishing; but, for the same reason, it requires a stronger constitution to digest it. Those who drink much of it, are usually fat and sleek in their bloom, but are often cut off by sudden fevers; or, if they avoid this, they fall early into a distempered old age.

The brown malt makes a drink much less viscid, and fitter to pass the several strainers of the body; but, if very strong, it may lead on to the same inconveniences with the pale: though a single debauch wears off much more easily in the brown.

Dr Quincy observes, that the best pale malt liquors are those brewed with hard waters, as those of springs and wells, because the mineral particles, wherewith these waters are impregnated, help to prevent the cohesions of those drawn from the grain, and enable them to pass the proper secretions the better; as the viscid particles of the grain do likewise defend these from doing the mischief they might otherwise occasion. But softer waters seem best suited to draw out the substance of high-dried malts, which retain many fiery particles in their contexture, and are therefore best lost in a smooth vehicle.

For the differences in the preparation of malt liquors, they chiefly consist in the use of hops, as in beer; or in the more sparing use of them, as in ale.

The difference made by hops is best discovered from the nature and quality of the hops themselves: these are known to be a subtle grateful bitter; in their composition, therefore, with this liquor, they add somewhat of an alkaline nature, *i. e.* particles that are sublime, active, and rigid. By which means, the ropy viscid parts of the malt are more divided and

subtilized: and are therefore not only rendered more easy of digestion and secretion in the body, but also, while in the liquor, they prevent it from running into such cohesions as would make it ropy, vapid, and sour.

For want of this, in unhopped drinks, that clammy sweetness, which they retain after working, soon turns them acid and unfit for use; which happens sooner or latter in proportion to the strength they receive from the malt, and the comminution that has undergone by fermentation.

It is a common opinion, that ale is more diuretic than beer; that is, liquor less hopped more than that with a greater quantity of hops in it: which may hold in some constitutions; because ale being more smooth, softening, and relaxing, where urine is to be promoted by enlarging the passage, as in thin, dry constitutions, this is the most likely to effect it. But, where the promoting of urine is to be done by attenuating and breaking the juices, and rendering them more fluid, it is certainly best answered by those drinks which are well hopped.

As to the dispute, whether or no hops tend to breed the stone; it is too long to enter upon here. Quincy is of opinion, there is but little reason for the affirmative side of the question; and in the general, makes no scruple to say, that, for one constitution damaged by beer, there are numbers spoiled by ale. This last manifestly fouls the glands, stuffs the vessels with slime and viscosity, makes the body unwieldy and corpulent, and paves the way for cachexies, jaundice, asthmas, and at last incurable dropsies. The urinary passages, also, which it is supposed to clear, will, in time, be filled by it with slough and matter of as ill consequence as gravel.

The different strengths of malt liquors also make their effects different. The stronger they are, the more viscid parts they carry into the blood; and though the spirituous parts make these imperceptible at first; yet when those are evaporated, which will be in a few hours, the other will be sensibly felt by pains in the head, nausea at the stomach, and lassitude or listlessness to motion. This those are the most sensible of who have experienced the extremes of drinking these liquors and wines; for a debauch of wine they find much sooner worn off, and they are much more lively and brisk afterwards, than after fuddling malt liquors, whose viscid remains will be long before they be shaken off.

Malt liquors therefore are, in general, the more wholesome for being small; *i. e.* of such a strength as is liable to carry a small degree of warmth into the stomach, but not so great as to prevent their being proper diluters of the necessary food. Indeed, in robust people, or those who labour hard, the viscidities of the drink may be broken into convenient nourishment; but in persons of another habit and way of living, they serve rather to promote obstructions and ill humours.

The age of malt liquors is the last thing by which they are rendered more or less wholesome. Age seems to do nearly the same thing as hops; for those liquors which are longest kept are certainly the least viscid; age breaking the viscid parts, and by degrees rendering them smaller, and fitter for secretion.

But

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But this is always determined according to their strength; in proportion to which, they will sooner or later come to their full perfection as well as decay; for, when ale or beer is kept till its particles are broken and comminuted as far as they are capable, then it is that they are best; and, beyond this, they will be continually on the decay, till the finer spirits are entirely escaped, and the remainder becomes vapid and sour.

MALT-Distillery. This is an extensive article of trade, and by which very large fortunes are made. The art is to convert fermented malt liquors into a clear inflammable spirit, which may be either sold for use in the common state of a proof strength, that is, the same strength with French brandy; or is rectified into that purer spirit usually sold under the name of *spirit of wine*; or made into compound cordial waters, by being distilled again from herbs and other ingredients. See BREWING and WASH.

To brew with malt in the most advantageous manner, it is necessary, 1. That the subject be well prepared; 2. That the water be suitable and duly applied; and, 3. That some certain additions be used, or alterations made, according to the season of the year, and the intention of the operator: and by a proper regulation in these respects, all the fermentable parts of the subject will thus be brought into the tincture, and become fit for fermentation.

The due preparation of the subject consists in its being justly malted and well ground. When the grain is not sufficiently malted, it is apt to prove hard, so that the water can have but very little power to dissolve its substance; and if it be too much malted, a part of the fermentable matter is lost in that operation. The harder and more flinty the malt is, the finer it ought to be ground; and in all cases, when intended for distillation, it is advisable to reduce it to a kind of finer or coarser meal. When the malt is thus ground, it is found by experience that great part of the time, trouble, and expence of the brewing is saved by it, and yet as large a quantity of spirit will be produced; for thus the whole substance of the malt may remain mixed among the tincture, and be fermented and distilled among it. This is a particular that very well deserves the attention of the malt distiller as that trade is at present carried on; for the dispatch of the business, and the quantity of spirit procured, is more attended to than the purity or perfection of it.

The secret of this matter depends upon the thoroughly mixing or briskly agitating and throwing the meal about, first in cold and then in hot water; and repeating this agitation after the fermentation is over, when the thick turbid wash being immediately committed to the still already hot and dewy with working, there is no danger of burning, unless by accident, even with ut the farther trouble of stirring, which in this case is found needless, though the quantity be ever so large, provided that requisite care and cleanliness be used; and thus the business of brewing and fermenting may very commodiously be performed together, and reduced to one single operation. Whatever water is made choice of, it must stand in a hot state upon the prepared malt, especially if a clear tincture be desired; but a known and very great inconve-

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nience attends its being applied too hot, or too near to a state of boiling; or even scalding with regard to the hand. To save time in this case, and to prevent the malt running into lumps and clods, the best way is to put a certain measured quantity of cold water to the malt first; the malt is then to be stirred very well with this, so as to form a sort of thin uniform paste or pudding; after which the remaining quantity of water required may be added in a state of boiling, without the least danger of making what, in the distillers language, is called a *pudden*.

In this manner the due and necessary degree of heat in the water, for the extracting all the virtues of the malt, may be hit upon very expeditiously, and with a great deal of exactness, as the heat of boiling water is a fixed standard which may be let down to any degree by a proportionate mixture of cold water, due allowances being made for the season of the year, and for the temperature of the air.

This little obvious improvement, added to the method just above hinted for the reducing brewing and fermentation to one operation, will render it practicable to very considerable advantage, and the spirit improved in quality as well as quantity.

A much more profitable method than that usually practised for the fermenting malt for distillation, in order to get its spirit, is the following: take ten pounds of malt reduced to a fine meal, and three pounds of common wheat-meal: add to these two gallons of cold water, and stir them well together; then add five gallons of water, boiling hot, and stir altogether again. Let the whole stand two hours, and then stir it again; and when grown cold, add to it two ounces of solid yeast, and let it by loosely covered in a warmish place to ferment.

This is the Dutch method of preparing what they call the *wash for malt spirit*, whereby they save much trouble and procure a large quantity of spirit: thus commodiously reducing the two businesses of brewing and fermenting to one single operation. In England the method is to draw and mash for spirit as they ordinarily do for beer, only instead of boiling the wort, they pump it into large coolers, and afterwards run it into their fermenting backs, to be there fermented with yeast. Thus they bestow twice as much labour as is necessary, and lose a large quantity of their spirit by leaving the gross bottoms out of the still for fear of burning.

All simple spirits may be considered in the three different states of low wines, proof spirit, and alcohol, the intermediate degrees of strength being of less general use; and they are to be judged of only according as they approach to or recede from these. Low wines at a medium contain a sixth part of pure inflammable spirit, five times as much water as spirit necessarily arising in the operation with a boiling heat. Proof goods contain about one half of the same totally inflammable spirit; and alcohol entirely consists of it.

Malt low-wines, prepared in the common way, are exceeding nauseous; they have, however, a natural vinosity or pungent agreeable acidity, which would render the spirit agreeable to the palate were it not for the large quantity of the gross oil of the malt that abounds in it. When this oil is detained in some measure

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Malt. measure from mixing itself among the low wines, by the stretching a coarse flannel over the neck of the still or at the orifice of the worm, the spirit becomes much purer in all respects; it is less fullsome to the taste, less offensive to the smell, and less milky to the eye. When these low wines, in the rectification into proof-spirits, are distilled gently, they leave a considerable quantity of this gross fetid oil behind them in the still along with the phlegm; but if the fire be made fierce, this oil is again raised and brought over with the spirit; and being now broken somewhat more fine, it impregnates it in a more nauseous manner than at first. This is the common fault both of the malt distiller and of the rectifier; the latter, instead of separating the spirit from this nasty oil, which is the principal intent of his process, attends only to the leaving the phlegm in such quantity behind, that the spirit may be of a due strength as proof or marketable goods, and brings over the oil in a worse state than before. To this inattention to the proper business of the process, it is owing, that the spirit, after its several rectifications, as they are miscalled, is often found more stinking than when delivered out of the hands of the malt distiller. All this may be prevented by the taking more time in the subsequent distillations, and keeping the fire low and regular; the sudden stirring of the fire, and the hasty way of throwing on the fresh fuel, being the general occasion of throwing up the oil by spurts, where the fire in general, during the process, has not been so large as to do that mischief.

The use of a *balneum mariæ*, instead of the common still, would effectually prevent all this mischief, and give a purer spirit in one rectification than can otherwise be procured in ten, or indeed according to the common methods at all.

Malt low wine, when brought to the standard of proof spirit, loses its milky colour, and is perfectly clear and bright, no more oil being contained in it than is perfectly dissolved by the alcohol, and rendered miscible with that proportion of phlegm, which is about one half the liquor: its taste also is cleaner, tho' not more pleasant; there being less of the thick oil to hang on the tongue than its own form; which is not the case in the low wines, where the oil being undissolved, adheres to the mouth in its own form, and does not pass lightly over it.

When proof-spirit of malt is distilled over again, in order to be rectified into alcohol, or, as we usually call it, spirits of wine, if the fire be raised at the time when the faints begin to fall off, a very considerable quantity of oil will be raised by it, and will run in the visible form of oil from the nose of the worm. This is not peculiar to malt spirit; but the French brandy shows the same phenomenon, and that in so great a degree, that half an ounce of this oil may be obtained from a single piece of brandy.

Malt spirit, more than any other kind, requires to be brought into the form of alcohol, before it can be used internally, especially as it is now commonly made up in the proof state, with as much of this nauseous and viscous oil as will give it a good crown of bubbles. For this reason it ought to be reduced to an alcohol, or totally inflammable spirit, before it is admitted into any of the medicinal compositions. If it be used with-

Malt. out this previous caution, the odious taste of the malt oil will be distinguished among all the other flavours of the ingredients.

Malt spirit, when it has once been reduced to the true form of an alcohol, is afterwards more fit for all the curious internal uses than even French brandy; it being after this purification a more uniform, hungry, tasteless, and impregnable spirit, than any other spirits which we esteem so much finer.

A pure spirit being thus procured, should be kept carefully in vessels of glass or stone, well stopped, to prevent the evaporation of any of its volatile part. If preserved in casks, it is apt to impregnate itself very strongly with the wood. The quantity of pure alcohol obtainable from a certain quantity of malt, differs according to the goodness of the subject, the manner of the operation, the season of the year, and the skillfulness of the workmen; according to which variations, a quarter of malt will afford from eight or nine to thirteen or fourteen gallons of alcohol. This should encourage the malt distiller to be careful and diligent in his business, as so very large a part of his profit depends wholly on the well conducting his processes.

After every operation in this business, there remains a quantity of faints, which in their own coarse state ought never to be admitted into the pure spirit; these are to be saved together, and large quantities of them at once wrought into alcohol. It is easy to reduce these to such a state that they will serve for lamp-spirits. Their disagreeable flavour being corrected by the adding of aromatics during the distillations, the reducing them into a perfect and pure alcohol is practicable, but not without such difficulties as render it scarce worth the trader's while. One way of doing it is by distilling them from water into water, and that with a very slow fire. By this means a pure alcohol may be made out of the foulest faints.

The malt distiller always gives his spirit a single rectification *per se*, in order to purify it a little, and make it up proof; but in this state it is not to be reckoned fit for internal uses, but serves to be distilled into geneva and other ordinary compound strong waters for the vulgar.

The Dutch, who carry on a great trade with malt spirit, never give it any farther rectification than this; and it is on this account, that the malt spirit of England is in general so much more in esteem. The Dutch method is only to distil the wash into low wines, and then to full proof spirit; they then directly make it into geneva, or else send it as it is to Germany, Guinea, and the East-Indies, for the Dutch have little notion of our rectification. Their spirit is by this means rendered very foul and coarse, and is rendered yet more nauseous by the immoderate use they make of rye-meal. Malt spirit, in its unrectified state, is usually found to have the common bubble proof, as the malt distiller knows that it will not be marketable without it.

The whole matter requisite to this is, that it have a considerable portion of the gross oil of the malt well broke and mixed along with it; this gives the rectifier a great deal of trouble if he will have the spirit fine; but in the general run of the business, the rectifier does not take out this oil, but breaks it finer, and mixes it faster in by alkaline salts, and disguises its

taste

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taste by the addition of certain flavouring ingredients. The spirit loses in these processes the vinosity it had when it came out of the hands of the malt distiller, and is in all respects worse, except in the disguise of a mixed flavour.

The alkaline salts used by the rectifier destroying the natural vinosity of the spirit, it is necessary to add an extraneous acid in order to give it a new one. The acid they generally use is the spiritus nitri dulcis; and the common way of using it is the mixing it to the taste with the rectified spirit: this gives our malt spirit, when well rectified, a flavour somewhat like that of French brandy, but this soon flies off; and the better method is to add a proper quantity of Glauber's strong spirit of nitre to the spirit in the still. The liquor in this case comes over impregnated with it, and the acid being more intimately mixed, the flavour is retained.

MALT-Bruiser, or Bruising-mill. It has been found by repeated experiments, that bruising malt is a more advantageous method than the old one of grinding and flouring. By bruising, there is not only less waste, but the malt is also better fitted for giving out all its virtues. It has lately, therefore, become a practice to squeeze malt between rollers, by means of a proper apparatus, of which various constructions have been invented. As the best contrivance of this sort is said to be the bruising-mill of Mr Winlaw, we have given a figure of it on Plate CCLXXXII. where AAAA is the frame; B, the large cylinder or roller; C, the small one; D, the hopper; E, the shoe; F, the frame that supports the hopper; G, a fly-wheel; H, the windlas. To use this engine, it is directed to screw the large roller up to the small one, and not to feed two fast from the shoe, which is regulated by pins that have strings fixed to them. It is evident, that when two smooth surfaces are opposed to each other at a distance which can be regulated at pleasure, neither grain nor any other similar substance can pass between them without being bruised. This being the principle on which the bruising-mill acts, the meally substance, which is the essential part of malt, is entirely removed from the skin or husk which contains it, and all the virtues of the malt are with ease extracted by the water in a manner superior to what is affected when the grain is only cut by grinding. The operation is at the same time so expeditiously performed, that two men can with ease bruise a bushel of malt in a minute. —By the same engine may also be bruised oats and beans for horses. A great part of the corn given these animals, it is well known, is swallowed whole, and often passes through them in the same state; in which case, they cannot receive any nourishment from the grains that are unbroken: but when bruised in this engine, it eases mastication; and every grain being prepared for nutrition, a much less quantity will of course be found to be sufficient. For bruising beans, the two regulating screws must be unscrewed a little; and the fly-wheel requires to be then set in motion with the hand, on account that the rollers are then a little space apart, and will not turn each other before the beans come between them.

MALT-Tax, is the sum of 750,000*l.* raised every year by parliament since 1697, by a duty of 6*d.* on the bushel of malt, and a proportionable sum on certain liquors, such as cyder and perry, which might

otherwise prevent the consumption of malt. This is under the management of the commissioners of the excise; and is indeed itself no other than the annual excise. In 1760, an additional perpetual excise of 3*d.* per bushel was laid upon malt; and in 1763, a proportional excise was laid upon cyder and perry, but new-modelled in 1766. See EXCISE.

MALTA, a celebrated island of the Mediterranean, situated between the 15th and 16th degrees of east longitude, and between the 35th and 36th degrees of north latitude. It is about 19 or 20 leagues in length, nine or ten in breadth, and 60 in circumference. Anciently it was called *Melita*; and is supposed by Cluverius, from its situation and other particulars, to be the Hiperia mentioned by Homer, whence the Phœaces were afterwards driven by the Phenicians, and retired into Scheria and the island of Corfu; which is the more probable, as the ancient poet places the mountain *Melita* in that island. He has likewise brought some probable arguments to prove, that *Melita* or *Malta* is the ancient *Ogygia*; in which the famed nymph *Calypso*, daughter of the Ocean and *Thetis*, received the shipwrecked *Ulysses*, and detained him seven years.

The most ancient possessors of Malta, of whom we have any certain account, were the Carthaginians; from whom it was taken by the Romans: and yet during the whole time that it continued under the power of these polite nations, it was almost entirely barren. The soil was partly sandy and partly rocky, having scarcely any depth of earth; and withal so stony, that it was hardly capable of producing corn or any other grain except cummin, and some seeds of a similar nature. Its chief products were figs, melons, honey, cotton, and some few other fruits and commodities which the inhabitants exchanged for corn; and in this barren state it seems to have continued till it came into the possession of the Maltese knights. It laboured also under great scarcity of water and fuel: upon all which accounts it was till that time but thinly inhabited, there being only about 30 or 40 boroughs or other villages scattered about, and no city except the capital, called also *Malta*, and the town and fort of *St Angelo*, which defended the harbour: so that the whole number of its inhabitants did not exceed 12,000, including women and children; the greatest part of whom were very indigent.

According to an ancient tradition, Malta was first possessed by an African prince named *Battus*, an enemy to queen *Dido*; from whom it was taken by the Carthaginians, as may be justly inferred from several Punic inscriptions to be seen on stone-pillars and other monuments yet standing. From the Carthaginians it passed to the Romans, who made themselves masters of it at the same time that they subdued the island of Sicily. These were driven out by the Arabs in the year 828; who were driven out of it in their turn by Roger the Norman, earl of Sicily, who took possession of it in 1190: from which time it continued under the dominion of the Sicilian princes till the time of Char. V. when it fell under his power, along with Naples and Sicily. To cover the island of Sicily from the Turks, Charles gave the island to the knights of Rhodes, since that time called knights of Malta.

The origin and history of these knights is given un-

Malta.

¹ Ancient history of the island.

² Malta given to the knights of Rhodes.

Malta.

der the article *Knights of MALTA and RHODES*. Here it is sufficient to observe, that in 1530, the knights of Rhodes having been expelled from that island by Soliman the Turkish sultan, and destitute of an habitation, accepted, tho' not without some reluctance on account of its barrenness, the offer made them by Charles V. of the island of Malta. The grand master having caused his two large carracks, the galleys of the order, and a good number of other transport-ships laden with great quantities of arms, ammunition, and troops, to be got ready, he and his knights embarked in the former, with all the effects, records, and treasure belonging to the order, and the rest in the latter. In their passage they suffered very much by a violent storm; in which one of their galleys split upon a rock, and one of the carracks was run aground by the violence of the waves, after having broke her three anchors. She stuck so fast, that they expected every moment to see her split in pieces; when providentially a contrary wind disengaged her without damage. This event was counted as a lucky omen, and on the 26th of October that year all the company were safely landed.

At the first landing of the Maltese knights, they found themselves obliged to lodge in a very poor town or borough at the foot of the hill on which stands the castle of St Angelo, and where their only habitations were fishermens huts. The grand-master, with the principal knights, took possession of the castle, where the accommodations were somewhat better: tho' these too were very mean, and out of repair. Three days after, he took possession of the city, which was formerly called *Malta*, but since that time hath taken the name of the *Notable City*; and after that, of the whole island of Malta, and the neighbouring one of Gosa.

The first care of the knights, after having settled their authority through the two islands, was to provide some better accommodation for the present, and to choose a proper place where to fix their habitation. But as the island had no other defence than the old castle of St Angelo, and was so much exposed on all sides, that it would have required greater sums than their exhausted treasury could spare to put it in a proper state of defence; the grand-master was obliged to content himself with surrounding the borough abovementioned, wherein he had ordered new buildings to be reared for the present habitation of his knights, with a stout wall, to prevent its being surprised by the Turkish and Barbary corsairs. His design indeed, at this time, was not to have fixed the abode of the knights in the bare and defenceless island of Malta, but to stay in it only till he had got a sufficient force to attempt the conquest of *Modon*, a town of the Morea, and which was not only a populous and opulent place, but lay very convenient for making an attempt on the island of Rhodes, their ancient habitation, and to which they were naturally attached. This, however, did not hinder his taking all proper measures for securing Malta as well as Gosa, and laying out a proper plan for securing them from attacks, in case the design on *Modon* should fail.

In the mean time, as superstition was then universally prevalent, the grand-master, among other precious relics which they had brought from Rhodes, cau-

sed the arm of St Catharine to be carried in procession to the cathedral. Whilst they were on their march, one of the centinels gave them notice, that a large Turkish merchantman was wrecked on their coast. The grand-master immediately dispatched some of his knights and soldiers thither; who finding Isaac the patron of the ship, a native of Modon, and one Maurithifala Nocher, an excellent engineer, they were retained in the service of the order, and the latter was immediately employed in fortifying the island.

The knights were hardly settled in Malta, when the emperor, and other European potentates, endeavoured to engage them in a war with the inhabitants of Barbary, as the city of Tripoli, then held by Charles, was in great danger of falling into the hands of the infidels. The attempt on Modon, however, was first made; but it proved unsuccessful through the base avarice of the Maltese forces: for they having been admitted into the city, during the night began to murder and plunder the inhabitants, without waiting for the arrival of the galleys which were coming to their assistance. The consequence was, that the inhabitants armed, and a desperate battle began; in which the Maltese, notwithstanding the utmost efforts, were obliged to retire, but not till they had loaded themselves with plunder, and carried away 800 women captive.

The grand-master, looking upon this disappointment as a sign that Providence had ordained Malta to be the residence of the knights, did not renew his attempts upon Modon; but, in 1532, joined with the emperor against the Turks, and sent a great number of his galleys to join the confederate fleet under the celebrated Andrew Doria. In consequence of this aid, the undertaking proved successful; and in all probability the conquest of Modon would have been accomplished, had not the soldiery, discouraged by the bad success of the last attempt, openly refused to proceed, and obliged the emperor to proceed to Coron, another town belonging to the Turks. Through the valour of the Maltese knights, this place was soon obliged to capitulate; and in a second expedition in 1533, the knights again distinguished themselves in a most eminent manner. They were quickly recalled, however, by the grand-master to the defence of the island, which was now threatened with an invasion by Barbarossa the celebrated Turkish corsair, who scoured those seas at the head of above fourscore galleys. This invasion, however, did not take place; and in 1534 the grand-master Villiers de L'Isle Adam died, and was succeeded by Perino de Ponte, a native of the town of Ast in Italy.

The new grand-master, who received intelligence of his election at St Euphemia in Calabria, very soon after received another express, giving an account of the wars which in that time reigned in Tunis, and the danger that Tripoli as well as Malta was in from Barbarossa, who was by this time become master both of Algiers and Tunis; upon which he made all the haste he could to his new government. His first care was to send a strong reinforcement to Italy; after which, he dispatched an embassy to the emperor, intreating him to equip a powerful fleet against Barbarossa, without which it would be impossible for Tripoli to hold out much longer.

Malta.

4
Join the emperor
against the
Turks.

3
They attempt the
conquest of
Modon
without
success.

Malta.
5
Africa in-
vaded by
Charles.

6
Desperate
valour of
the Maltese
knights.

By this embassy from De Ponte, and another to the same purpose from Muley Hassan, the deposed king of Tunis, Charles was easily prevailed on to carry his arms into Africa; in which he was assisted by a great number of the bravest knights, together with 18 brigantines of different sizes, four of the best Maltese galleys, and their vessel called the *great carrack*, of itself almost equivalent to a squadron. In this expedition the knights distinguished themselves in a most eminent manner. At the siege of Goletta, one of the knights, named *Conversa*, an excellent engineer, by means of a *barcalonga*, got almost close to the great tower, which he furiously battered with large cannon, while the great carrack, which was behind all the rest of the vessels, and by reason of its height could fire over them, did prodigious execution. A breach was soon made; and hardly was it wide enough to be scaled, when the Maltese knights jumped out of the galleys into their long-boats, and thence into the sea, with their swords in their hands, and waded through the water above their girdles, it being too shallow for boats to approach the shore. The standard-bearer of the order was the first that jumped into the water, and led the rest to the attack; they claiming every where the post of honour. They marched with the greatest resolution through the most terrible firing and showers of all kinds of missile weapons; and, having gained the shore, quickly ascended the breach, on the top of which they planted their great standard. A great number lost their lives, and scarce one came off unwounded; but the emperor did them the justice to own, that the taking the place was chiefly owing to the valour of the Maltese knights.

7
Privileges
conferred
upon them
by the em-
peror.

The city of Tunis was soon taken after the fortress of Goletta; on the surrender of which, the emperor, designing to return into Europe, took his last dinner on board the great carrack; where he was magnificently entertained, and bestowed on the surviving knights the greatest encomiums, and marks of his esteem and gratitude to the owner. These he accompanied with considerable presents and with two new grants. By the first, they were allowed to import corn and other provisions from Sicily, without paying duty; and by the second, the emperor engaged, that none of the order should enjoy any of the estates or revenues, due to Maltese knights, throughout all his dominions, unless they were lawfully authorized by the grand-master and his council; or till the originals had been examined and registered by himself, or such ministers as he should appoint for that purpose. The fleet then set sail for Malta; where, on their arrival, they received the news of the grand-master's death, who was succeeded by Didier de Tolon de St Jalle, a native of Provence, and then grand prior of Tholouse, where he resided at the time of his election.

8
The Turks
make an
unsuccess-
ful attempt
on Tripoli.

The present grand-master was a man of great conduct and bravery, which he had formerly shown at the siege of Rhodes; and the situation of affairs at this time required a person of experience. The Turkish corsairs, quite tired out with the dreadful havoc made among them by Botigella, grand prior of Pisa, who seldom quitted the sea, and never failed out without sinking some of them, or making considerable prizes, had agreed to enter into a strong confederacy, either to surprise the city of Tripoli where his retreat was,

or, if that failed, to lay siege to it by sea and land; in either of which attempts, they were sure of all the assistance of Barbarossa and Hayradin, then lord of Tagiora. This last had undertaken the command and conduct of the whole enterprise; but the governor-being informed of the design, prepared to give him a warm reception. Hayradin came thither with his whole force in the dead of the night, and began to scale the walls in those places where he reckoned them to be most defenceless. They no sooner appeared at the foot of them, than the garrison, which had been kept up in arms, poured down such streams of wild-fire, boiling oil, melted lead, &c. and threw such volleys of stones, while the great and small guns so annoyed those that stood farthest off, that great numbers of them were destroyed. They persisted in the attack, however, with great fury and vigour, till Hayradin, who was foremost in one of the escalades, was knocked down by a musket-shot from the top of his ladder. He fell into the ditch, and was taken up almost dead; upon which his troops instantly dispersed themselves, and abandoned the enterprise. The governor of Tripoli, however, judging that this would not be the last visit of the kind which in all probability he would receive, immediately dispatched an express to Malta, with proposals for fortifying the city, and demolishing a strong tower on that coast named *Alcaid*, which was held by a Turkish corsair. His advice being approved of, the commander Botigella, now general of the galleys, was immediately dispatched with a sufficient force; who, having landed his men at Tripoli, immediately marched, with them and a body of Arab mercenaries towards Alcaid; and without staying to open the trenches, or any other covering than his gabions, levelled his artillery against it. Hayradin being informed of this, came with his Turks to its defence; but was intercepted by a strong detachment of Maltese knights at the head of the hired Arabs, and repulsed with loss; so that all he could do was to convey about 50 or 60 Turks into the place, and to annoy the Christians with some slight skirmishes. Botigella, perceiving that his cannon did not make such quick dispatch as he wished, sent some of his galleys; under the shelter of which he quickly sprung a mine, which brought down part of the wall, and buried most of the corsairs under it; upon which the rest, seeing the Maltese knights mount the breach sword-in-hand, immediately threw down their arms. The tower was then razed to the ground; after which Botigella marched to a town called *Adabus*, whence he drove Hayradin, who had intrenched himself in it, and gave the plunder to the Arabs. In his return he attacked and took a large Turkish galley, the cargo of which was valued at 160,000 crowns, and had on board 200 persons; so that he landed in triumph, and was received with the loud acclamations of the whole order, who came to meet him on his arrival. Soon after the grand-master fell sick and died, and was succeeded by John de Homedes.

The Maltese still continued to behave with their usual valour against the Turks; but, through the negligence of Charles V. almost all the places held by the Christians on the African coast were reduced by the infidels, and the valour exerted by the Maltese served only to destroy great numbers of them. At last the emperor's affairs in Africa were totally ruined by his

Malta.

9
The emperor saved by the valour of the Maltese knights.

his unsuccessful expedition against ALGIERS, an account of which was given under that article, n^o 12—18. Here indeed it is thought that the emperor himself could not have escaped, had not the Maltese knights repulsed the Turks, who had attacked even the imperial quarters. They pursued them even to the gates of the city, and were in hopes of entering it with them; but the governor having caused the gates to be shut before the Turks had all got in, the knights were disappointed. When the Spanish troops reembarked, the Maltese were also of great service in repulsing the enemy; and indeed behaved on both occasions with so much valour and intrepidity, that the rest of the allies could not sufficiently admire them. The misfortune, however, was, that the loss they suffered, both of men and ships, especially by some of their best commanders, more than counterbalanced the glory they had gained. The emperor, before they parted, gave them the most ample testimony of his satisfaction and gratitude, as far as words and encomiums could go; after which, the Maltese commander set sail, with the small remains of his knights, in three shattered vessels, and arrived safely at the port of Malta about the end of November 1548.

While the Maltese were employed in this unfortunate expedition, the island was so terribly annoyed by the Turkish and other corsairs, that the port was in some measure blocked up by them; whilst the coasts, both here and at Gosa, lay exposed to frequent insults and depredations, and often to the loss of their inhabitants. This obliged the Maltese admiral Simeoni to refit his galleys with all possible expedition, and again put to sea in quest of these enemies. In this enterprise he succeeded so well, that he sent home a great number of the corsair captains in chains. Being obliged to put in at the port of Tripoli, the governor informed him, that he had just received an express from the king of Tunis, acquainting him that Barbarossa was making the most pressing complaints to the Porte against the Maltese knights, whilst his lieutenant Morat Haga was making great preparations at Tachora for the siege of Tripoli, which he doubted not would be followed by that of Tunis; the king having become odious to the Turks and Moors on account of his alliance with the emperor; after whose late disaster a great number of towns in that kingdom had revolted from him, and a much greater number of his subjects had put themselves under the protection of the Algerine monarch, who was expected shortly from Constantinople at the head of a powerful fleet.

On the receipt of these unwelcome news, an embassy was sent to the emperor, in order to persuade him to cause the fortifications of Tripoli be repaired; but without success. All that could be obtained was fair

10
The Turks take Tripoli, and resolve to expel the knights from Malta.

words and promises; the consequence of which was, that the Maltese made most violent and almost incredible exertions against their enemies, till at last Soliman resolved to expel the knights from Malta, as he had before done from Rhodes. To this he was chiefly instigated by Dragut, an old experienced corsair, who had obtained the command of his fleet after the death of Barbarossa. The siege was accordingly commenced in 1551; but, by a stratagem, the Turkish commander was induced to depart. However, he reduced the castle of Gosa and the city of Tripoli. Nothing

happened of great consequence from that time till the year 1564, when fresh complaints being made to Soliman, he proposed, in a grand council, where most of his officers attended, to extirpate the knights altogether. This design was strenuously opposed by Hali, one of Dragut's most experienced captains, who offered the most solid reasons against it; but being overruled by the rest, an expedition against Malta was resolved upon. One of the sultan's first cares was to send some spies, in the disguise of fishermen, to take a full view of the island, who found means to bring him an exact plan of it, with all its fortifications, havens, strength, the number of its inhabitants, &c. whilst he was hastening his armaments against it. By this time, as the Maltese had very little reason to doubt that the Turkish armaments were designed against their island, the viceroy of Sicily, Don Garcia, was ordered by his master to take it in his way to the castle of Goletta, in order to consult with the grand-master about the necessary means for opposing such a formidable power. The grand-master acquainted him, that, in case of an attack upon Malta, he should want both men and corn: upon which the viceroy engaged to supply him with both on his return to Sicily; in pledge of which he left one of his sons with him, who was afterwards admitted into the order. He was no sooner departed, than the grand-master summoned all the knights of the order, dispersed through several parts of Europe, to repair to him. Those that were in Italy raised a body of 2000 foot, to which the viceroy of Sicily added two companies of Spanish forces. All the galleys of the order were employed in transporting these troops, together with all manner of provisions and ammunition, into the island; and the knights that were in it, in distributing, disciplining, and exercising their new levies, as well as the Maltese militia, against the siege. Thus the grand-master saw himself strengthened by the arrival of 600 knights, all of whom brought with them retinues of stout good servants, fit to assist in the defence of the island; whilst those, who by reason of age, sickness, or other impediments, could not to repair to him, sold their most valuable effects in order to assist him with their purses. The pope, on his part, contented himself with sending a supply of 10,000 crowns; and the king of Spain ordered his viceroy Don Garcia to raise an army of 20,000 men, to be ready to sail thither as soon as called for. The grand-master employed the remainder of his time in visiting all the forts, magazines, arsenals, &c. and assigning to each tongue their several posts, and making all necessary preparations, till the Ottoman fleet appeared in sight on the 18th of May 1565. It consisted of 159 large galleys and galleons, carrying on board 30,000 forces, janizaries and spahis, besides the slaves at the oar, accompanied by a considerable number of other vessels, laden with artillery, ammunition, and other necessities for a siege. The whole armament was commanded by Mustapha Basha, an old experienced officer, aged about 85 years, and an old favourite and confident of the sultan; of an haughty cruel temper, who made it a merit to violate his word, and to use all manner of violence against the Christians, especially against the Maltese. This formidable army landed at some distance from Il Borgo, and soon afterwards spread themselves over the country; setting fire to the villages,

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11
The siege commenced.

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villages, putting the peasants to the sword, and carrying off such of the cattle as, notwithstanding the orders of the grand-master, had not been secured within the forts and towns.

While the Turks were thus employed, La Valette (the grand master) sent out De Copier, marshal of the order, with 200 horse and 600 foot, to watch their motions. De Copier, an officer of great experience, executed his commission with so much prudence and vigour, that, by falling unexpectedly on detached parties, he cut off 1500 Turks, with the loss only of 80 men.

The Turkish general held a council of war as soon as all his troops were landed, to assist him in resolving where he should begin his attack. Piali, the Turkish admiral, agreeably to what he understood to have been the sultan's instructions, was of opinion that they ought not to enter upon action till Dragut should arrive. But Mustapha having received information of the king of Spain's preparations, thought something ought to be done instantly for the safety of the fleet; which lay at present in a creek, where it was exposed to the violence of the east wind, and might be attacked with great advantage by the Spaniards. On this account he was of opinion, that they should immediately lay siege to a fort called *St Elmo*, which stood on a neck of land near *Il Borgo*, having the principal harbour on one side of it, and on the other another harbour large enough to contain the whole fleet in safety. This proposal was approved by a majority of the council, and Mustapha proceeded without delay to carry it into execution.

12
Desperate
defence of
fort St Elmo.

La Valette did not expect that a place which was neither strong nor large enough to admit a numerous garrison, could be defended long against so great a force as was employed to reduce it; but he thought it necessary that the siege of this fort should be prolonged as much as possible, in order to give the viceroy of Sicily time to come to his relief. With this view, he resolved to throw himself into *St Elmo*, with a select body of troops; and he was preparing to set out, when the whole body of knights remonstrated with such earnest importunity against his leaving the town, that he at last consented to suffer the reinforcement, which he had prepared, to be conducted to the fort by a knight called *De Medran*, upon whose conduct and intrepidity he could rely with the most assured confidence.

Not long after *De Medran's* arrival in the fort, the garrison made a vigorous sally, in which they drove the enemy from their entrenchments, and put a number of them to the sword. But the rest soon recovered from their surprise; and having returned to the charge, they compelled the Christians to retire. In this rencounter, the vigorous efforts of the Janisaries were favoured by the wind, which blew the smoke of the guns upon the fort, and covered the besieged with a thick cloud, through which it was impossible to discern the operations of the enemy. This incident the Turks had the presence of mind to improve to very great advantage. They seized, unperceived, upon the counterscarps; made a lodgment there with beams, woolfacks, and gabions; and raised a battery upon it with incredible expedition. After the smoke was dispersed, the besieged beheld what had been done

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with much astonishment; and they were the more disquieted, as the fortification which the Turks had raised upon the counterscarp overtopped a ravelin which lay near it, in which the besieged could no longer appear with safety. They resolved, however, to defend this ravelin as long as possible, whatever it should cost them.

In the mean time *Dragut*, and another noted Corsair named *Uluchiali*, arrived with 20 galleys; having, besides slaves and seamen, 2500 troops on board. This reinforcement, and the presence of *Dragut*, added fresh vigour to the operations of the siege. This gallant Corsair exposed himself, on all occasions, with the utmost intrepidity; spent whole days in the trenches; and as, besides his other extraordinary talents, he was particularly skilful in the management of artillery, he caused some new batteries to be raised in more advantageous situations than had hitherto been made choice of; and kept up a continual fire both on the ravelin above mentioned and a cavalier that covered the fort, and was one of its principal defences.

This cavalier soon became the only defence which could prevent the besiegers from coming up to the very foot of the wall. Some Turkish engineers having approached the ravelin at day-break, to observe the effects of their artillery, they perceived a gun-port so low, that one of them, when mounted on the shoulders of another, looked into it, and saw the Christian soldiers lying on the ground asleep. Of this they gave immediate information to the troops; who, advancing as quickly and silently as possible, and clapping ladders to the gun-hole, got up into the ravelin, and cut most of the Christians to pieces.

Between this ravelin and the cavalier lay the ditch, over which the besieged had thrown a temporary bridge of planks leading up to the cavalier. The Turks, perceiving this, leaped instantly upon the bridge, and attempted to make themselves masters of the cavalier, as they already were of the ravelin. But the garrison was now alarmed; the bravest of the knights hastened from different quarters to the post of danger; and, after an obstinate engagement, they compelled the Turks to retire into the ravelin. There, observing another way of reaching the cavalier by a path from the bottom of the ditch, they threw themselves down without dread or hesitation; and having ascended by this path to the other side, they renewed their attack with greater fury than ever. The combat lasted from sun-rise till noon, when the knights at last proved victorious. About 20 knights and 100 soldiers were killed; and near 3000 of the enemy.

As the ravelin was open on the side towards the fort, the besieged pointed some cannon against it, and made great havock among the infidels. But Mustapha, sensible of the value of the acquisition he had made, poured in fresh soldiers without number, and the pioneers coming forward with woolfacks, planks, and gabions, put the troops at length in safety, and made a lodgment in the ravelin, of which the garrison were never afterwards able to dispossess them.

The grand-master's concern on account of this disaster was greatly augmented, by considering, that it could not have happened so soon without some negligence on the part of the garrison. He sent them, however, an immediate reinforcement; and both the siege

Malta. siege and the defence were carried on with the same vigour as before.

But the situation of the besieged was now become much more dangerous than formerly. The Turks applied with unremitting diligence to heighten the ravelin till it overtopped the wall of the fort; and after this the garrison could no longer appear upon the parapet with safety. Many were killed by the enemy's artillery, several breaches were made in the wall, and the hearts of the bravest knights began to fail within them.

13
The knights desire permission to leave the fort, but are refused.

They agreed therefore, though with much reluctance, to apply to the grand-master for liberty to quit the fort; and they made choice of the chevalier de Medran for their messenger. He represented that the fort was in reality no longer tenible; and that, to continue in it, though only for a few days, would infallibly occasion the destruction of the garrison.

Most of the knights in council thought that this request of the garrison ought to be immediately granted. But la Valette was of a contrary opinion.—This he represented to the chevalier de Medran; and sent him back with instructions to remind the knights of the vows which they took, at their entrance into the order, of sacrificing their lives for its defence. He likewise had him assure them, in his name, that he would not fail to send them such reinforcements as they should stand in need of; and was determined, as soon as it should be necessary, to come himself to their assistance, with a fixed unalterable purpose to lay down his life sooner than deliver the fort into the hands of the infidels.

This answer had the desired effect on several of the knights, and particularly on those whose principles of honour and attachment to the order were confirmed by years. But the greater part of them were much dissatisfied. They thought the grand-master's treatment of them harsh and cruel; and wrote him a letter, subscribed by 53; in which, after repeating their former request, they informed him, that if he did not, on the next night, send boats to carry them to the town, they were determined to sally out into the Turkish camp, where they might fall honourably by the sword, instead of suffering such an ignominious death as they had reason to expect if the fort was taken by storm.

To this letter la Valette replied, "That they were much mistaken if they expected to satisfy their honour by throwing away their lives; since it was no less their duty to submit to his authority, than to sacrifice their lives in defence of the order: that the preservation of the whole depended on their present obedience to his commands: that no aid was to be expected from Spain if the fort were given up. And that if he should yield to their request, and bring them to the town, the town itself would then be immediately invested; and they, as well as the rest, soon afterwards reduced to a situation more desperate than that from which they were so solicitous to escape, by deserting an important post which they had undertaken to defend." Besides this letter, he sent three commissioners to examine the state of the fortifications; intending by this measure either to gain time or to prevent the garrison from sinking into despair.

These commissioners differed very widely in the accounts which they delivered at their return. Two of them thought it impossible to defend the fort much longer. But the third, named Constantine Castriot, a Greek prince, descended from the famous Albanian hero Scanderbeg, whether from ignorance or a consciousness of greater resources in his native courage than the other two possessed, maintained that the garrison was far from being reduced to the last extremity; and to give proof how firmly he was persuaded of the truth of what he said, he offered to enter the fort himself, and to undertake the defence of it with such troops as should be willing to accompany him.

The grand-master, strongly impressed with a sense of the necessity of protracting the siege, immediately accepted this offer, and bestowed the highest encomiums on Castriot's zeal and resolution. Nor did Castriot find any difficulty in persuading a sufficient number to attend him, who were no less zealous and resolute than himself. The soldiers crowded to his standard, and were emulous to have their names enrolled for that dangerous service in which he had engaged.

When la Valette saw the spirit by which these men were animated, and had no longer any doubt of being able by their means to prolong the siege of the fort; he sent a letter to the knights, acquainting them, that he was now willing to give them their discharge; and would immediately send another garrison, into whose hands he desired they should be ready to deliver up the fort, and come themselves to the town in the boats in which their successors were to be transported.

The contents and style of this letter affected the knights in the most sensible manner, and roused within them that delicate sense of honour by which the order had been so long and so eminently distinguished.—They resolved without hesitation to remain in the fort till every man should perish, rather than either deliver it to the new garrison or abandon it to the enemy. And they went in a body to the governor, and intreated him to inform the grand-master of their repentance, and to join with them in praying that they might be suffered to wipe out the remembrance of their fault by their future conduct.

The grand-master suffered himself at last to be overcome; and henceforth the garrison, dismissing all thoughts of their own safety, were intent on nothing but how to prolong the defence.

The grand-master sent them every night fresh troops to supply the place of the killed and wounded; and kept them well furnished with provisions, ammunition, and fire-works. Of these last he had invented a particular kind, which consisted of hoops of wood, covered with wool, and steeped in boiling oil and other inflammable liquors, mixed with nitre and gunpowder. To these machines they set fire, and threw them flaming in the midst of the enemy when they were crowded together at an assault. It happened often that two or three of the Turks were hooked together and scorched to death; and the utmost confusion was produced wherever they were thrown.

The besieged stood much in need of this, and every other instrument of mischief that could be devised, for their

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14

Invention of burning hoops.

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their defence. In spite of the most vigorous opposition, the Turks had cast a bridge over the ditch, and begun to sap and undermine the wall. From the 17th of June to the 14th of July, not a single day passed without some rencounter; and Mustapha had frequently attempted to scale the wall of the fort, but had been as often repulsed with the loss of some of the bravest of his troops.

Ashamed at having been detained so long before a place of such inconsiderable strength, he resolved to make one great decisive effort; and to bring to the assault as many of his forces as the situation of the place would permit him to employ. He had already made several breaches; but in order to secure the success of the assault which he now intended, he kept his batteries playing all the 15th without intermission, till the wall on that side where he designed his attack was almost level with the rock. On the 16th, the fleet was drawn up before sunrise, as near the fort as the depth of the water would allow. Four thousand musketeers and archers were stationed in the trenches: and the rest of the troops, upon a signal given, advanced to the breach. The garrison was prepared to receive them; the breach was lined with several ranks of soldiers, having the knights interspersed among them at certain distances. The Turks attempted often to break through this determined band, and to overpower them with their numbers; but their numbers served only to augment the loss which they sustained. Every shot from the fort did execution. The artillery made dreadful havoc among them; and the burning hoops were employed with astonishing success. The novelty of these machines, and the shrieks of those who were caught in them, added greatly to the terror which they inspired; and made it impossible for the Turkish officers to keep their men firm and steady in pursuing the advantages which, had they preserved their ranks, their numbers must have infallibly acquired.

At length Mustapha, after having continued the assault for more than six hours, without gaining a single inch of ground on the besieged, gave orders for founding a retreat. In this attack the garrison lost about 20 knights and 300 soldiers; but this loss was immediately supplied by a reinforcement from the town; and Mustapha was at last convinced, that, unless the communication between the fort and the town were cut off, it would be impossible to bring the siege of the former to a period, while any troops remained in the other parts of the island. By the advice of Dragut, he resolved to extend his trenches and batteries on the side next the town, till they should reach to that part of the sea, or great harbour, where those supplies were landed which the grand-master daily sent to the garrison. This undertaking he knew must be attended with the utmost difficulty, because all the space between his intrenchments, and the point to which it was necessary to extend them, lay exposed to the artillery both of fort St Elmo and St Angelo. In viewing the ground, a Sangiac, in whom he put confidence, was killed by his side; and, which was still a more irreparable loss, Dragut received a mortal wound, of which he died in a few days. This did not, however, discourage Mustapha from pursuing his design. By employing his troops and pioneers at the work day

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and night, without intermission, he at length carried it into execution. Then having planted batteries along the shore, and filled his trenches with musketeers, it was impossible for any boat to pass from the town to the fort without the most imminent danger of either being sunk or intercepted.

After this precaution, he resumed with fresh vigour his attempts to take the fort by storm. On the 21st he made four different assaults: all of which the garrison withstood; and, in repulsing so many thousand brave and well-disciplined troops, displayed a degree of prowess and fortitude which almost exceeds belief, and is beyond the power of description. But this heroic garrison was now exceedingly reduced in number; and there was the strongest reason to apprehend, that, in one assault more, they must inevitably be overpowered, unless a reinforcement were sent them from the town. Of their desperate situation they gave intelligence to the grand-master by one who swam across the harbour in the night. The boats were instantly filled with knights and other soldiers, who generously resolved to devote themselves to certain destruction for the general safety, and the preservation of the fort. They set off from the town with as much alacrity as if they had entertained the most sanguine hopes of victory; but they found the Turks every where so much upon their guard, and the lines so strongly defended, that, after several fruitless attempts to land, they were at last obliged to return, depressed with sorrow for the fate of their brave companions.

The garrison, now despairing of relief, gave themselves up for lost; but instead of either capitulating or attempting to escape, they prepared for death, and passed the night in prayer and in receiving the sacrament; after which they embraced one another tenderly, and then repaired to their respective posts; while such of the wounded as had been disabled from walking, were, at their own earnest desire, carried to the side of the breach, where they waited, without dismay, for the approach of the Turkish army.

Early in the morning of the 23d of July, the Turks advanced to the assault with loud shouts, as to certain victory, which they believed so small a handful of men as now remained in the fort would not dare to dispute with them. In this expectation they were disappointed. The garrison being resolved on death, and despising danger, were more than men; and exerted a degree of prowess and valour that filled their enemies with amazement. The combat lasted upwards of four hours, till not only every knight but every soldier had fallen, except two or three who had saved themselves by swimming. The Turkish colours were then planted on the ramparts; and the fleet entered the harbour, which the fort commanded, in a kind of triumph. When Mustapha took a view of the fort, and examined its size and fortifications, he could not refrain from saying, "What will not the father cost us (meaning the town), when the son, who is so small, has cost so many thousands of our bravest troops?" But this reflection, far from exciting his admiration of that heroic fortitude which he had found so difficult to overcome, served only to inspire him with a brutal fury. He ordered all such of the garrison as were found lying on the breach alive to be ript open, and their

Malta.

15
The fort
taken, and
the garrison
cut off.

16
Cruelty of
Mustapha.
hearts

Malta. hearts torn out : and, as an insult on the knights and their religion, he caused their dead bodies to be searched for, and large gashes to be made in them, in the form of a cross; after which he tied them on planks, and threw them into the sea, to be carried by the wind and tide to the town or fort St Angelo.

17 And of the grand-master. The grand-master was at first melted into tears at this shocking spectacle ; but his grief was soon converted into indignation and revenge : and these passions betrayed him into an action unworthy of the exalted character which he bore. In order to teach the basha, as he pretended, to make war with less barbarity, he caused all the Turks whom he had taken prisoners to be massacred ; and then putting their heads into his largest cannon, he shot them into the Turkish camp.

In the siege which has been related, the order lost about 1500 men, including 130 of the bravest knights.

Mustapha vainly imagined, that, being intimidated by the fate of their companions, they would be now inclined to listen to terms of capitulation : and in this hope, he sent an officer with a white flag to one of the gates, attended by a Christian slave designed to serve for his interpreter. The Turk was not allowed to enter within the town ; but the Christian was admitted, and was led through several ranks of soldiers under arms by an officer, who, after showing him all the fortifications of the place, desired him to take particular notice of the depth and breadth of the ditch, and said to him, " See there, the only spot we can afford your general ; and there we hope soon to bury him and all his Janisaries."

This insulting speech being reported by the slave, excited in the fiery mind of the basha the highest degree of wrath and indignation, and made him resolve to exert himself to the utmost in the prosecution of the siege. His troops, though greatly diminished, were still sufficient to invest at once both the town and the fort of St Michael. He kept a constant fire on both ; but he intended first to apply to the reduction of the latter, which he proposed to attack both by land and water, at the extremity of the peninsula on which it stands. In order to accomplish this design, it was necessary he should have some shipping introduced into the harbour for transporting his forces. But the mouth of the harbour having been rendered inaccessible by a great iron chain and the cannon of St Angelo, his design must have been relinquished, if Piali had not suggested an expedient against which the grand-master had not provided. This was, to make the Christian slaves and the crews of the ships draw a number of boats, by the strength of their arms, over the neck of land on which stood fort St Elmo. Of this proposal, which Mustapha immediately adopted, information was carried to the grand-master by a Turkish officer ; who, being by birth a Greek, was touched suddenly with remorse, and deserted to the Christians. In consequence of this intelligence, La Valette set a great number of hands to work in framing a stacado along that part of the promontory where the Turks intended their attack ; and at another part, where the depth of the water or the hardness of the bottom would not admit the stacado, he caused strong intrenchments to be made upon the

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beach. Mustapha, in the mean time, fired incessantly upon the fort, while the slaves and crews were employed in transporting the boats over land into the harbour. At length the basha, judging that the number of boats which he had transported would be sufficient, and that the breaches which his artillery had made were practicable, resolved, without further delay, to make an attack both by sea and land. He was the more confident of success, as, since the taking of St Elmo, he had received a considerable reinforcement, by the arrival of Hascem, son of Barbarossa, with 2500 select soldiers, commonly called *the Bravoes of Algiers*. Hascem, who possessed a considerable share of his father's fire, and was ambitious to distinguish himself in the sultan's service, begged of Mustapha to intrust him with the assault of fort St Michael ; and vaunted, with his natural arrogance, that he would soon make himself master of it sword-in-hand. The basha, whether from an opinion of his valour, or an intention to make him learn at his own expence the folly of his presumption, readily complied with his request ; and, having added 6000 men to his Algerines, he promised to support him with the rest of his army.

Hascem divided his forces with Candelissa, an old corsair, his lieutenant ; to whom he committed the attack by sea, whilst he reserved that on the land-side to himself.

Candelissa having put his troops on board the boats, set out with drums beating, and hautboys and other musical instruments playing, preceded by a boat filled with Mahometan priests, some of whom were employed in offering prayers to heaven for his success, or in singing hymns ; while others had books in their hands, out of which they read imprecations against the Christians. Candelissa attempted first to break down the stacado which had been formed to obstruct his landing ; but finding it much stronger than he expected, and that, while he was employed in demolishing it, his troops must suffer greatly from the enemy's fire, he thought it would be easier to make a descent on that part of the shore which the grand-master had strengthened with entrenchments. At this important post, the Christian troops were commanded by an ancient knight of the name of *Guimeran*. This experienced officer reserved his fire till the Turks had advanced within a little distance of the shore, when, by a single discharge, he killed about 400 men. This did not prevent the rest from approaching. Candelissa pushed forwards while the Christians were loading their cannon, and landed at the head of his Algerines. But Guimeran having reserved some cannon charged with grape-shot, did dreadful execution among them after they had landed, and many of them began to fly to their boats : which Candelissa observing, he commanded the boats to be put off to a little distance from the shore. His troops, perceiving then that they must either die or conquer, took courage from despair, and advanced boldly to the intrenchment, with ladders for scaling it in one hand and their sabres in the other. The combatants on both sides displayed the most intrepid valour. Great numbers fell, and the ditch was choaked with blood, and with the bodies of the dead and wounded. The Turks at last, after an engagement of five hours, reached the top of the entrench-

Malta.

18 The Turks repulsed with great slaughter.

Malta.

ment, and there planted their ensigns. The knights, stung with shame on account of their retreat, returned with redoubled ardour. But they would probably have been overpowered by the superior number of the enemy, had not the grand-master sent them a seasonable reinforcement, under the admiral de Giou and the chevalier de Quiney; who fell upon the Algerines and Turks with a degree of fury that struck terror into Candelissa himself, who was noted for his intrepidity. Having ordered the boats to be brought nearer the shore, he was among the first who fled. His braves fought desperately for some time after he had left them; but were at length thrown down from the intrenchments, and compelled to fly to their boats with the utmost precipitation. The Christians pursued them, and the batteries continued firing on them without intermission. Many of the boats were sunk; the water was covered with dead bodies, mangled limbs, shields, and helmets. Of the 4000 who had been sent on this enterprise, scarcely 500 remained, and many of these were dangerously wounded.

Hascem was not more fortunate in his assault by land than Candelissa was by sea. After having been repulsed at one breach with great slaughter, he rallied his troops, and led them on to another, where he fought long and desperately, till, most of the braves having fallen by his side, he was obliged, with much reluctance and sorrow, to sound a retreat.

Mustapha, not unmindful of his promise to support him, no sooner perceived him beginning to retire, than he ordered the Janisaries, whom he kept under arms, to advance. The garrison had maintained an engagement with Hascem for five hours, in the middle of the day, and in the hottest season of the year; yet, as if they had not been subject to the wants and weaknesses of humanity, they advanced beyond the breach to meet the Janisaries, and fought apparently with as much vigour and fortitude as before. By the power of superior numbers, they were compelled to fall back within the breach. But there they made the most desperate resistance; and, being reinforced by De Giou and De Quiney, with the troops which had triumphed over Candelissa, they at last repulsed the Janisaries with dreadful slaughter; after having lost more than 40 knights, and 200 of the bravest of the common men.

Mustapha, enraged by this invincible obstinacy which the Christians displayed in their defence, and dreading that the Spanish succours, which had been already delayed much longer than he expected, might soon arrive, resolved now to employ his whole force at once; and while he himself prosecuted the siege of fort St Michael with one half of his troops, to employ the other, under Piali, against the town. More batteries were raised; the trenches were advanced still nearer than before; bridges of sail-yards and masts were thrown over the ditches; mines, notwithstanding the hard and rocky soil, were sprung; assaults were repeated without number; and the two bashas, emulous of one another, and each of them agitated with continual anxiety lest victory should declare first for his competitor, exhibited the most shining proofs of personal courage, and exhausted all the art of war then known in the world. Yet, through the determined bravery of the knights, conducted by the grand-ma-

ster with consummate prudence and indefatigable vigilance, the Turks were baffled in every attempt, and repulsed with slaughter. Mustapha flattered himself once with the most sanguine hopes of success on his part, from a machine invented by his principal engineer, in the form of a huge cask bound strongly with iron hoops, and filled with gunpowder, nails, chains, bullets, and such other instruments of death. After setting fire to a train which was fastened to this machine, it was thrown, by the force of an engine, upon a ravelin that was the principal defence of the fort. But the garrison, undismayed, found means, before it caught fire, to cast it out again into the midst of the assailants. In a moment afterwards it burst with dreadful fury, and filled the Turks with consternation. The knights then sallied out upon them sword-in-hand; and, taking advantage of their confusion, killed many of them, and put the rest to flight.

Piali had, on some occasions, still more reason than Mustapha to entertain the hopes of victory, although the town was much stronger than the fort, and La Vallette commanded there in person. By his batteries he had demolished all the out-works of the place, and had made an immense breach in the wall. While his troops were engaged in a furious assault, that engrossed the whole attention of the besieged from morning till night, he employed a great number of pioneers in raising a cavalier or platform of earth and stones, close by the breach, and so high as to overlook the parapet. Night, in the mean time, came on, and prevented him from carrying any further this great advantage; but he doubted not that next day he should be able to make himself master of the place.

As soon as he had drawn off his forces, a council of the order was convened, and most of the knights were of opinion that the town was no longer tenible; that the fortifications which still remained should be blown up; and that the garrison and inhabitants should retire into the castle of St Angelo. But the grand-master received this proposal with horror and indignation. "This would be in effect (said he) to deliver the whole island into the hands of the infidels. Fort St Michael, which has been so gallantly defended, and which is preserved by its communication with the town, would thus be soon reduced to the necessity of surrendering. There is no room in the castle of St Angelo for the inhabitants and troops; nor, if there were room, is there water in that fort for so great a number." It was then proposed, that at least the relics of the saints and the ornaments of the churches should be carried into the castle; and the knights earnestly intreated the grand-master to retire into it himself, assuring him that they would conduct the defence with the utmost vigour and vigilance. "No, my brethren (he replied), what you propose as to the sacred things would serve only to intimidate the soldiers. We must conceal our apprehensions. It is here we must either die or conquer. And is it possible that I, at the age of 71, can end my life so honourably as in fighting, together with my friends and brethren, against the implacable enemies of our holy faith? He then told them what he thought proper to be done, and proceeded instantly to put it into execution. Having called all the soldiers from fort St Angelo, except a few who were necessary for managing the artillery, he employed them

19
Incredible
valour of
the Mal-
tese.

Malta.

20

A great
number of
Turks de-
stroyed by
a contri-
vance of
their own.

21

The grand-
master pre-
vents the
knights
from aban-
doning the
town.

Malta.

them and the inhabitants all night in throwing up intrenchments within the breach; after which he sent out some of the bravest knights, with a select body of troops, to make an attempt on the cavalier. These men stole softly along the foot of the wall till they arrived at the place appointed; when they set up a loud shout, and attacked the guards whom Piali had left there with so much fury, that the Turks, believing the whole garrison had fallen upon them, abandoned their post, and fled precipitately to their camp.

The cavalier was immediately fortified, a battery of cannon planted on it, and a parapet raised on the side towards the enemy. And thus the breach was rendered impracticable; the town put in greater security than before; and a work, which had been devised for its destruction, converted into a bulwark for its defence.

The grand-master had now greater confidence than ever of being able to hold out till the Spaniards should come to his relief. In consequence of the assurances given by Philip and the Sicilian viceroy, he had, long before this time, entertained the hopes of their arrival; and had often earnestly solicited the viceroy to hasten his departure from Messina. The conduct of this nobleman was long exceedingly mysterious. The patience of the knights was worn out by his delays; and they, and many others, suspected that the real motive of his conduct was the dread of encountering with an admiral of so considerable reputation as Piali. But it afterwards appeared that the viceroy had acted agreeably to his instructions from the court of Spain. For although Philip was, for the reasons above mentioned, sincerely interested in the preservation of the knights, and had amused them with the most flattering promises of assistance; yet he seems from the first to have resolved not to expose himself to danger on that account, and to avoid if possible a general engagement.

22
Ungrateful
and ungenerous
conduct of the
king of
Spain.

A generous and grateful prince would have acted very differently towards an ally so deserving of his support; and if either generosity or gratitude had been the leading principle of Philip's conduct, it is probable he would, on this occasion, have regarded the knights as his own subjects; and have thought it no less incumbent on him to exert himself in their defence, than if they had acknowledged him as their sovereign.

But Philip was affected by their danger only so far as it threatened the tranquillity of his own dominions. He had resolved to interpose in their behalf, rather than to suffer them to be overpowered; but he appears to have been very little touched with their calamities, and to have intended to leave them to themselves, as long as there was any prospect of their being able to make resistance; by doing which he considered, that he would not only preserve his own strength entire, but might afterwards engage with the Turks when they were exhausted by the operations of the siege.

Philip adhered inflexibly to this plan, notwithstanding the grand-master's repeated importunities; much longer than was consistent with his own selfish views. For, without a degree of fortitude and prowess on the part of the garrison, and a degree of wisdom, vigilance, and magnanimity on that of the grand-master, infinitely higher than there could be reason to expect, it must have been impossible for such a handful of men to have withstood, for so long a time, so great a force,

2

and such mighty efforts, as were employed to reduce them. Even the death of the grand-master alone, whose person was exposed to perpetual danger, would have proved fatal to the knights, long before Philip sent orders to his viceroy to give them any effectual support; and in this case, as his own dominions or his fleet would have been immediately attacked, he would probably have had little reason to be satisfied with the timid ungenerous counsels which he pursued.

Whatever judgment may be formed on this head, the viceroy did not think himself at liberty to yield to the repeated applications of the grand-master, till the operations of the siege began to relax, and the Turkish forces were reduced from 45,000 to 15,000 or 16,000; of whom many were worn out with the fatigues which they had undergone, and others rendered unfit for action by a bloody-flux, which for several weeks had raged amongst them.

In this situation of affairs, when it was probable that the knights would, without assistance, have compelled the Turks to raise the siege, the viceroy let the grand-master know, that he had now received such instructions from the king, as put it in his power to show his attachment to the order: that he was not indeed permitted to attack the Turkish fleet; but that he would immediately bring him a strong body of troops, whose commanders (as he himself must return to Sicily) were to be entirely subject to the grand-master's authority till the enemy should be expelled.

The viceroy, altho' still suspected of interposing unnecessary delays, at length fulfilled his promise; and on the 7th of September landed 6000 men, under Don Alvaro de Sandé and Ascanio della Corna, in that part of the island which lay at the greatest distance from the Turks; after which, he immediately carried back the fleet to Sicily.

23
The knights
receive a
reinforce-
ment.

In the mean time, intelligence being brought to Mustapha that the Spaniards were landed, and marching towards him, he was thrown into the most dreadful consternation. Sensible that his soldiers were much disheartened by their ill success, he imagined that he was about to be attacked by a superior army, consisting of the bravest and best disciplined troops in Spain. Without waiting for information of their number, he forthwith raised the siege, drew his garrison out of St Elmo, and, leaving all his heavy cannon behind him, embarked his troops with as much precipitation as if the Spaniards with superior forces had been in sight. He had scarcely got on board when a deserter arrived from the Spanish camp, and informed him, that with 15,000 or 16,000 men, he had fled before an army that did not exceed 6000, having no general at their head, and commanded by officers who were independent of one another. The basha was overwhelmed with shame and vexation by this intelligence, and would have immediately disembarked; but this, he knew, he durst not attempt without consulting Piali, Hascem, and his other principal officers.

24
The Turks
raise the
siege in a
panic.

While he was deliberating upon it, the grand-master improved to the best advantage the leisure that was afforded him. He employed all the inhabitants, men, women, and children, as well as the soldiers, in filling up the enemy's trenches, and demolishing their works; and put a garrison without delay into fort St Elmo; in which the Turks now beheld from their ships the stand-

3 R 2

dard

Malta.

dard of St John erected, where that of Mahomet had lately stood.

This demonstrated to Mustapha how much new labour awaited him in case he should return to the siege; but being enraged against himself on account of the precipitancy of his retreat, and disquieted at the thoughts of the reception which he had reason to expect from Solyman, he wished to atone for his imprudence, and to wipe off the reproach in which it had involved him, by victory or death. Piali, who, from his jealousy of the basha's credit with the sultan, was not sorry for the failure of his enterprise, represented in a council of war convened on this occasion, That as the troops were much dispirited and worn out, it would be exposing them to certain destruction, either to lead them against the enemy, or to resume the operations of the siege. But a majority of the council were of a different opinion; and it was resolved to land the forces again without delay.

25
They re-
turn, but
are defeat-
ed.

The Turkish soldiers complained bitterly of this unexpected resolution, and obeyed the orders to disembark with the greatest reluctance. Their officers were obliged to employ threats with some and force with others. At length the number intended was put on shore, and Mustapha set out at their head in search of the enemy.

The grand-master had not neglected to give early notice of their march to the Spanish commanders, who had intrenched their little army on a steep hill, which the Turks would have found almost inaccessible; and it was the opinion of some of the principal officers, that they should avail themselves of the advantage of their situation, and stand on their defence. But this proposal was rejected with disdain by the bold adventurous De Sande, and the greatest part of the Spanish officers; and the troops were led out of their encampment, to meet the enemy in the open field. This conduct, more fortunate perhaps than prudent, contributed to increase the dejection of the Turkish soldiers, and to facilitate their defeat. Having been dragged against their inclination to the field of battle, and being attacked by the Spaniards with great fury, both in front and flank, they scarcely fought, but, being struck with a sudden panic, fled with the utmost precipitation.

Mustapha, confounded and enraged by this pusillanimous behaviour of his troops, was hurried along by the violent tide of the fugitives. He fell twice from his horse, and would have been taken prisoner if his officers had not rescued him. The Spaniards pursued briskly till they came to the sea-shore. There Piali had his boats ready to receive the Turks, and a number of shallops filled with musketeers drawn up to favour their escape. Without this precaution, they must all have perished; and, even notwithstanding the protection which it afforded them, the number of their killed amounted to 2000 men, while the victors lost only 13 or 14 at most.

Such, after four months continuance, was the conclusion of the siege of Malta, which will be for ever memorable on account of that extraordinary display of the most generous and heroic valour by which the knights, so few in number, were enabled to baffle the most vigorous efforts which could be made to subdue them by the most powerful monarch in the world. The

news of their deliverance gave universal joy to the Christian powers; and the name of the grand-master excited every where the highest admiration and applause. Congratulations were sent him from every quarter; and in many states public rejoicings were celebrated on account of his success.

With this siege is concluded every thing of importance in the history of Malta. The power of the Turks began about this time to be so much circumscribed, that they ceased to be formidable to the Christian nations, and the knights of Malta had no longer an opportunity of exerting their valour as formerly. They have remained ever since in quiet possession of their island, of which the best description we have met with is that given by Mr Brydone.

26
Description
of the
island, &c.
“ The approach of the island (says he) is very fine, although the shore is rather low and rocky. It is everywhere made inaccessible to an enemy by an infinite number of fortifications. The rock, in many places, has been sloped into the form of a glacis, with strong parapets and intrenchments running behind it.—On getting ashore we found ourselves in a new world indeed.—The streets (of Valetta) crowded with well-dressed people, who have all the appearance of health and affluence; and we were conducted by the English consul to an inn, which had more the appearance of a palace.

“ After dinner we went to visit the principal villas of the island; particularly those of the grand-master and the general of the galleys, which lie contiguous to one another. These are nothing great or magnificent; but they are admirably contrived for a hot climate, where, of all things, shade is the most desirable. The orange-groves are indeed very fine, and the fruit they bear superior to any thing of the kind in Spain or Portugal.

“ The aspect of the country is far from being pleasing: the whole island is a great rock of very white free-stone; and the soil that covers this rock is, in most places, not more than five or six inches deep; yet, what is singular, we found their crop in general was exceedingly abundant. They account for it from the copious dews that fall during the spring and summer months; and pretend likewise that there is a moisture in the rock below the soil, that is of great advantage to the corn and cotton, keeping its roots perpetually moist and cool: without which singular quality, they say, they could have no crop at all, the heat of the sun being so exceedingly violent.—The whole island produces corn only sufficient to supply its inhabitants for five months or little more; but the crop they most depend upon is the cotton. They begin to sow it about the middle of May, and continue till the middle of June; and the time of reaping is in the month of October and beginning of November.

“ They pretend that the cotton produced from this plant, which is sown and reaped in four months, is of a much superior quality to that of the cotton-tree. I compared them; but I cannot say I found it so: this is indeed the finest; but that of the cotton-tree is by much the strongest texture. The plant rises to the height of a foot and an half; and is covered with a number of nuts or pods full of cotton: These, when ripe, they are at great pains to cut off every morning before sun-rise; for the heat of the sun immediately turns

Malta. turns the cotton yellow; which indeed we saw from those pods they save for seed.

"They manufacture their cotton into a great variety of stuffs. Their stockings are exceedingly fine. Some of them, they assured us, had been sold for ten sequins a-pair. Their coverlets and blankets are esteemed all over Europe. Of these the principal manufactures are established in the little island of Gozzo, where the people are said to be more industrious than those of Malta, as they are more excluded from the world, and have fewer inducements to idleness. Here the sugar-cane is still cultivated with success, though not in any considerable quantity.

"The Maltese oranges certainly deserve the character they have of being the finest in the world. The season continues for upwards of seven months, from November till the middle of June; during which time those beautiful trees are always covered with abundance of delicious fruit. Many of them are of the red kind, much superior, in my opinion, to the others, which are rather too luscious. They are produced, I am told, from the common orange-bud, ingrafted on the pomegranate stock. The juice of this fruit is as red as blood, and of a fine flavour. The greatest part of their crop is sent in presents to the different courts of Europe, and to the relations of the chevaliers.

The industry of the Maltese in cultivating their little island is inconceivable. There is not an inch of ground lost in any part of it; and where there was not soil enough, they have brought over ships and boats loaded with it from Sicily, where there is plenty, and to spare. The whole island is full of inclosures of free-stone, which give the country a very uncouth and barren aspect; and in summer reflects such a light and heat, that it is exceedingly disagreeable and offensive to the eyes. The inclosures are very small and irregular, according to the inclination of the ground. This, they say, they are obliged to observe, notwithstanding the deformity it occasions; otherwise the floods, to which they are subject, would soon carry off their soil.

"The island is covered over with country-houses and villages, besides seven cities, for so they term them; but there are only two, the Valetta, and Citta Vecchia, that by any means deserve that appellation. Every little village has a noble church, elegantly finished, and adorned with statues of marble, rich tapestry, and a large quantity of silver-plate.

"The city of Valetta has certainly the happiest situation that can be imagined. It stands upon a peninsula between two of the finest ports in the world, which are defended by almost impregnable fortifications. That on the south side of the city is the largest. It runs about two miles into the heart of the island; and is so very deep, and surrounded by such high grounds and fortifications, that they assured us the largest ships of war might ride here in the most stormy weather, almost without a cable.

"This beautiful basin is divided into five distinct harbours, all equally safe, and each capable of containing an immense number of shipping. The mouth of the harbour is scarcely a quarter of a mile broad, and is commanded on each side by batteries that would tear the strongest ship to pieces before she could

enter. Besides this, it is fronted by a quadruple battery, one above the other, the largest of which is a *fleur d'eau*, or on a level with the water. These are mounted with about 80 of their heaviest artillery: so that this harbour, I think, may really be considered as impregnable; and indeed the Turks have ever found it so, and I believe ever will.

"The harbour on the north side of the city, although they only use it for fishing, and as a place of quarantine, would, in any other part of the world, be considered as inestimable. It is likewise defended by very strong works; and in the centre of the basin is an island on which they have built a castle and a lazaret.

"The fortifications of Malta are indeed a most stupendous work. All the boasted catacombs of Rome and Naples are a trifle to the immense excavations that have been made in this little island. The ditches, of a vast size, are all cut out of the solid rock. These extend for a great many miles, and raise our astonishment to think that so small a state has ever been able to make them.

"One side of the island is so completely fortified by nature, that there was nothing left for art. The rock is of a great height, and absolutely perpendicular from the sea for several miles. It is very singular, that on this side there are still the vestiges of several ancient roads, with the tracks of carriages worn deep in the rocks. These roads are now terminated by the precipice, with the seas beneath; and show, to a demonstration, that this island has formerly been of a much larger size than it is at present; but the convulsion that occasioned its diminution is probably much beyond the reach of any history or tradition. It has been often observed, notwithstanding the very great distance of mount *Ætna*, that this island has generally been more or less affected by its eruptions; and they think it probable, that on some of these occasions a great part of it may have been shaken into the sea.

"One half of mount *Ætna* is clearly discovered from Malta. They reckon the distance near 200 Italian miles. And the people of Malta affirm, that, in great eruptions of the mountain, their whole island is illuminated, and from the reflection in the water there appears a great track of fire all the way from Malta to Sicily. The thundering of the mountain is likewise distinctly heard.

"We made an expedition through the island in coaches drawn by one mule each; the only kind of vehicle the island affords. The catacombs, not far from the ancient city of Melita, are a great work: they are said to extend for 15 miles under-ground. Many people, they assure us, have been lost in them by advancing too far; the prodigious number of branches making it next to impossible to find the way out again. The great source of water that supplies the city of Valetta takes its rise near to this place; and there is an aqueduct, composed of some thousand arches, that conveys it from thence to the city. The whole of this immense work was finished at the private expence of one of the grand-masters.

"Not far from the old city there is a small church dedicated to St Paul; and just by the church a miraculous statue of the saint, with a viper on his hand; supposed to be placed on the very spot where the house stood.

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Malta.

stood in which he was received after his shipwreck on the island, and where he shook the viper off his hand into the fire without being hurt by it: at which time the Maltese assure us, the saint cursed all the venomous animals of the island, and banished them for ever. Whether this be the cause of it or not, the fact is certain that there are no venomous animals in Malta. They assured us, that vipers had been brought from Sicily, and died almost immediately on their arrival.

“ Adjoining to the church is the celebrated grotto in which the saint was imprisoned. It is looked upon with the utmost reverence and veneration; and if the stories they tell of it be true, it is well entitled to it all. It is exceedingly damp, and produces (I believe by a kind of petrification from the water) a whitish kind of stone, which, they assure us, when reduced to powder, is a sovereign remedy in many diseases, and saves the lives of thousands every year. There is not a house in the island that is not provided with it: and they tell us there are many boxes of it sent annually, not only to Sicily and Italy, but likewise to the Levant, and to the East Indies; and (what is considered as a daily standing miracle) notwithstanding this perpetual consumption, it has never been exhausted, nor even sensibly diminished; the saint always taking care to supply them with a fresh quantity the day following. I tasted some of it, and believe it is a very harmless thing. It tastes like exceeding bad magnesia, and, I believe, has pretty much the same effects. They give about a tea-spoonful of it to children in the small-pox and in fevers. It produces a copious sweat about an hour after, and, they say, never fails to be of service. It is likewise esteemed a certain remedy against the bite of all venomous animals. There is a very fine statue of St Paul, in the middle of this grotto, to which they ascribe great powers.

“ The grand-master of the knights of Malta is more absolute, and possesses more power, than most sovereign princes. His titles are, *serene highness* and *eminence*; and his household-attendance and court are all very princely. As he has the disposal of all lucrative offices, he makes of his councils what he pleases; besides, in all the councils that compose the jurisdiction of this little nation, he himself presides, and has two votes. He has the disposal of 21 commanderies, and one priory, every five years; and as there is always a number of expectants, he is very much courted. He is chosen by a committee of 21; which committee is nominated by the seven nations, three out of each nation. The election must be over within three days of the death of the former grand-master; and, during these three days, there is scarce a soul that sleeps at Malta: all is cabal and intrigue; and most of the knights are masked, to prevent their particular attachments and connections from being known: the moment the election is over, every thing returns to its former channel.

“ The land-force of Malta is equal to the number of men in the island fit to bear arms. They have about 500 regulars belonging to the ships of war; and 150 compose the guard of the prince. The two islands of Malta and Gozzo contain about 150,000 inhabitants. The men are exceeding robust and hardy. I have seen them row for 10 or 12 hours without intermission, and without even appearing to be fatigued. Their sea-force

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consists of 4 galleys, 3 galliots, 4 ships of 60 guns, and a frigate of 36, besides a number of the quick-sailing little vessels called *scampavias* (literally *runaways*). Their ships, galleys, and fortifications, are not only well supplied with excellent artillery, but they have likewise invented a kind of ordnance of their own, unknown to all the world besides. For we found, to our no small amazement, that the rocks were not only cut into fortifications, but likewise into artillery, to defend these fortifications, being hollowed out, in many places, into the form of immense mortars. The charge is said to be about a barrel of gunpowder, over which they place a large piece of wood, made exactly to fit the mouth of the chamber. On this they heap a great quantity of cannon-balls, shells, or other deadly materials; and when an enemy's ship approaches the harbour, they fire the whole into the air: and they pretend it produces a very great effect; making a shower for 200 or 300 yards round, that would sink any vessel.

“ Notwithstanding the supposed bigotry of the Maltese, the spirit of toleration is so strong, that a mosque has been lately built for their sworn enemies the Turks. Here the poor slaves are allowed to enjoy their religion in peace. It happened lately that some idle boys disturbed them during their service; they were immediately sent to prison, and severely punished. The police indeed is much better regulated than in the neighbouring countries, and assassinations and robberies are very uncommon; the last of which crimes the grand-master punishes with the utmost severity. He is said to be much more relaxed with regard to the first.

“ Perhaps Malta is the only country in the world where duelling is permitted by law. As their whole establishment is originally founded on the wild and romantic principles of chivalry, they have ever found it too inconsistent with those principles to abolish duelling; but they have laid it under such restrictions as greatly to lessen its danger. These are curious enough. The duellists are obliged to decide their quarrel in one particular street of the city; and if they presume to fight any where else, they are liable to the rigour of the law. But, what is not less singular, but much more in their favour, they are obliged, under the most severe penalties, to put up their swords when ordered to do so by a *woman*, a *priest*, or a *knight*. Under these limitations, in the midst of a great city, one would imagine it almost impossible that a duel could ever end in blood; however, this is not the case: a cross is always painted opposite to the spot where a knight has been killed, in commemoration of his fall. We counted about 20 of these crosses.

“ About three months ago (Mr Brydone's letter is dated June 7. 1770), two knights had a dispute at a billiard-table. One of them, after giving a great deal of abusive language, added a blow; but, to the astonishment of all Malta (in whose annals there is not a similar instance), after so great a provocation, he absolutely refused to fight his antagonist. The challenge was repeated, and he had time to reflect on the consequences; but still he refused to enter the lists. He was condemned to make the *amende honorable* in the great church of St John for 45 days successively; then to be confined in a dungeon, without light, for five years; after which, he is to remain a prisoner in the castle for life.

Malta. life. The unfortunate young man who received this blow is likewise in disgrace, as he has not had an opportunity of wiping it out in the blood of his adversary.

"The horse-races of Malta are of a very uncommon kind. They are performed without either saddle, bridle, whip, or spur; and yet the horses are said to run full speed, and to afford a great deal of diversion. They are accustomed to the ground for some weeks before; and although it is entirely over rock and pavement, there are very seldom any accidents. They have races of asses and mules performed in the same manner four times every year. The rider is only furnished with a machine like a shoemaker's awl, to prick on his courser if he is lazy.

"As Malta is an epitome of all Europe, and an assemblage of the younger brothers, who are commonly the best, of its first families, it is probably one of the best academies for politeness in this part of the globe; besides, where every one is entitled by law as well as custom to demand satisfaction for the least breach of it, people are under a necessity of being very exact and circumspect, both with regard to their words and actions."

Knights of MALTA, otherwise called *Hospitalers of St John of Jerusalem*, a religious military order, whose residence is in the island of Malta, situated in the Mediterranean sea, upon the coast of Africa. The Knights of Malta, so famous for defending Christendom, had their rise as follows:

Some time before the journey of Godfrey of Bouillon into the Holy Land, some Neapolitan merchants, who traded in the Levant, obtained leave of the caliph of Egypt to build an house for those of their nation who came thither on pilgrimage, upon paying an annual tribute. Afterwards they built two churches, and received the pilgrims with great zeal and charity. This example being followed by others, they founded a church in honour of St John, and an hospital for the sick; whence they took the name of *Hospitalers*. A little after Godfrey of Bouillon had taken Jerusalem, in 1099, they began to be distinguished by black habits and a cross with eight points; and, besides the ordinary vows, they made another, which was to defend the pilgrims against the insults of the infidels. This foundation was completed in 1104, in the reign of Baldwin; and so their order became military, into which many persons of quality entered, and changed the name of *hospitalers* into that of *knights*.

When Jerusalem was taken, and the Christians lost their power in the East, the knights retired to Acre or Ptolemais, which they defended valiantly in 1290. Then they followed the king of Cyprus, who gave them Limasson in his dominions, where they staid till 1310. That same year they took Rhodes, under the grand-master Foulques de Villaret, a Frenchman; and next year defended it against an army of Saracens: since which the grand-masters have used these four letters, F. E. R. T. i. e. *Fortitudo ejus Rhodum tenuit*; and the order was from thence called *knights of Rhodes*.

In 1522, Soliman having taken Rhodes, the knights retired into Candia, and thence into Sicily. In 1530, Charles V. gave them the island of Malta, to cover his kingdom of Sicily from the Turks. In 1566, Soliman besieged Malta; but it was gallantly defended by

the grand-master John de Valette Parisot, and the Turks obliged to quit the island with great loss.

The knights consisted of eight different languages or nations, of which the English were formerly the sixth; but at present they are but seven, the English having withdrawn themselves. The first is that of Provence, whose chief is grand commendator of religion: the second, of Auvergne; whose chief is mareschal of the order: the third, of France, whose chief is grand-hospitaler: the fourth, of Italy; and their chief, admiral: the fifth, of Arragon; and their chief, grand-conservator: the sixth, of Germany; and their chief, grand-bailiff of the order: the seventh, of Castile; and their chief, grand-chancellor. The chief of the English was grand-commander of the cavalry.

None are admitted into this order but such as are of noble birth both by father and mother's side for four generations, excepting the natural sons of kings and princes. The knights are of two sorts; those who have a right to be candidates for the dignity of grand-master, called *grand-crosses*; and those who are only *knights-assistants*, who are taken from good families. They never marry; yet have continued from 1099 to the present time.

The order consists of three estates; the knights, chaplains, and servants at arms. There are also priests who officiate in the churches; friar-servants, who assist at the offices; and *donnes*, or *demi-crosses*; but these are not reckoned as constituent parts of the body. This division was made in 1130, by the grand-master Raimond du Puy.

The government of the order is mixed, being partly monarchical, and partly aristocratical. The grand-master is sovereign, coins money, pardons criminals, and gives the places of grand-priors, bailiffs, knights, &c. The ordinary council is composed of the grand-master and the grand-crosses. Every language has several grand priories, and every priory a certain number of commanderies.

The knights are received into this order, either by undergoing the trials prescribed by the statutes, or by dispensation. The dispensations are obtained either by the pope's brief, or by a general chapter of the order, and are granted in case of some defect as to the nobility of their pedigree, especially on the mother's side. The knights are received, either as of age, under minority, or pages to the grand-master. They must be 16 years old complete before they are received: they enter into the novitiate at 17, and are professed at 18. They sometimes admit infants of one year old; but the expence is about 4000 livres. The grand-master has 16 pages who serve him, from 12 to 16 years of age. The knights wear on the left side of their cloak or waistcoat a cross of white waxed cloth, with eight points, which is their true badge; that of gold being only for ornament. When they go to war against the Turks, they wear a red cassock, with a great white cross before and behind, without points, which are the arms of the religion. The ordinary habit of the grand-master is a sort of cassock of tabby-cloth, tied about with a girdle, at which hangs a great purse, to denote the charitable institution of the order. Over this he wears a velvet gown; and on the left side a white cross with eight points. His yearly revenue is 10,000 ducats. He acknowledges the kings of Spain, and both

Malton
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both the Sicilies, as his protectors; and is obliged, by his agreement with the emperor Charles V. to suppress pirates.

MALTON, a town of the north-riding of Yorkshire in England, seated on the river Derwent, over which there is a good stone-bridge. It is composed of two towns, the New and the Old; and is well inhabited, accommodated with good inns, and sends two members to parliament. W. Long. 0. 30. N. Lat. 54. 8.

MALVA, the MALLOW: A genus of the polyanthia order, belonging to the monadelphia class of plants; and in the natural method ranking under the 37th order, *Columnifera*. The calyx is double; the exterior one triphyllous; the arilli numerous and monospermous. There are 24 species; consisting of herbaceous perennials, biennials, and annuals, for medical, economical, and ornamental uses; rising with erect stalks from about half a yard to 10 or 12 feet high, garnished with large, roundish, lobated leaves, and quinquepetalous flowers. They are all easily and plentifully raised from seed.

The leaves of the common mallow are reckoned the first of the four emollient herbs: they were formerly in some esteem as food, for loosening the belly; at present, decoctions of them are sometimes employed in dysenteries, heat, and sharpness of urine; and, in general, for obtunding acrimonious humours: their principal use is in emollient glysters, cataplasms, and fomentations. The leaves enter the officinal decoction for glysters, and a conserve is prepared from the flowers.

Several species of malva, macerated like hemp, afford a thread superior to hemp for spinning, and which is said to make more beautiful cloths and stuffs than even flax. These species are the crispa, Peruviana, and Maurifiana. From the former, which affords stronger and longer fibres, cords and twine have also been made. From the malva, likewise, a new sort of paper has been fabricated by M. de l'Isle. On this invention, Mess. Lavoisier, Sage, and Berthollet, in name of the *Academie de Sciences*, observe, That "it is not probable the paper made by M. de l'Isle will be substituted for that made from rags, either for the purpose of printing or writing. Yet paper from the mallows may be used for these purposes, if we can judge from a volume printed on it presented to the academy. The great utility of M. de l'Isle's invention is for furniture, which consumes a great quantity of rags; and his papers have a natural hue, much more solid than can be given by colouring matter, and this hue may serve as a ground for other drawings. M. de l'Isle should, we think, be encouraged to pursue his experiments, which, we have reason to expect, may be in the end very useful: by his zeal, activity, and knowledge, he will probably contribute to render the art of making paper more perfect; in this art he is much engaged; and his attempts, which he has shown to the academy, merit its praises."

MALVERN, GREAT and LITTLE, (with the *Chace* and the *Hills*); two towns of Worcestershire, in which were formerly two abbeys, about three miles asunder. Since the dissolution nothing remains of the abbey of *Great Malvern* but the gateway of the abbey and church, now parochial. Part of it was a religious cell for hermits before the Conquest; and the

N^o 193.

greatest part, with the tower, built in the reign of William the Conqueror. Its outward appearance is very striking. It is 171 feet in length, 63 in breadth, and 63 in height. In it are ten stalls; and it is supposed to have been rebuilt in the year 1171. The nave only remains in part, the side aisles being in ruins. The windows have been beautifully enriched with painted glass, and in it are remains of some very ancient monuments. *Little Malvern* stands in a cavity of the hills, which are great lofty mountains, rising like stairs, one higher than another, for about seven miles, and divide this county from Herefordshire. There is a ditch here very much admired. On the hills are two medicinal springs, called *holy wells*, one good for the eyes, and the other for cancers. Henry VII. his queen, and his two sons prince Arthur and prince Henry, were so delighted with this place, that they beautified the church and windows, part of which remain, though mutilated. In the lofty south windows of the church are the historical passages of the Old Testament; and in the north windows the pictures of the holy family, the nativity and circumcision of our Saviour, the adoration of the shepherds and the kings, his presentation in the temple, his baptism, fasting, and temptation, his miracles, his last supper with his disciples, his prayer in the garden, his passion, death, and burial, his descent into hell, his resurrection and ascension, and the coming of the Holy Ghost. The history of our Saviour's passion is painted differently in the east window of the choir, at the expence of Henry VII. whose figure is therefore often represented, as is that of his queen. In the west window is a noble piece of the day of judgment, not inferior to the paintings of Michael Angelo. *Malvern Chace* contains 7115 acres in Worcestershire (besides 241 acres called the Prior's Land), 619 in Herefordshire, and 103 in Gloucestershire. *Malvern Hills* run from north to south, the highest point 1313 feet above the surface of the Severn at Hanley, and appear to be of lime-stone and quartz. On the summit of these hills is a camp with a treble ditch, imagined to be Roman, and is situated on the Herefordshire side of the hills.

MALVEZZI (Virgilio marquis de), an Italian gentleman, born at Bologna, acquired great reputation by his learning and writings. He was well versed in polite literature, music, law, physic, and the mathematics. He served also in a distinguished post in the army of Philip IV. king of Spain, and was employed by him in some important negotiations. He died at Bologna in the year 1654, leaving several works in Spanish and Italian. Among the latter are his *Discourses on the First Book of Tacitus*: this work has been translated into English.

MALUS, in botany. See PYRUS.

MAMALUKES, the name of a dynasty that reigned in EGYPT. See that article, n^o 98.

MAMBRUN (Peter), an ingenious and learned French Jesuit, born in the diocese of Clermont, in the year 1581. He was one of the most perfect imitators of Virgil in Latin poetry, and his poems are of the same species: Thus he wrote *Eclogues*; *Georgics*, or four books on the culture of the soul and the understanding; together with a heroic poem intitled *Constantine, or Idolatry overthrown*. He showed also great

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Mambrun.

Mamertini critical abilities in a Latin *Peripatetical dissertation on epic poetry*. He died in 1661.

Mammon.

MAMERTINI, a mercenary band of soldiers which passed from Campania into Sicily at the request of Agathocles. When they were in the service of Agathocles, they claimed the privilege of voting at the election of magistrates at Syracuse, and had recourse to arms to support their unlawful demands. The sedition was appeased by the authority of some leading men, and the Campanians were ordered to leave Sicily. In their way to the coast they were received with great kindness by the people of Messina, and soon returned perfidy for hospitality. They conspired against the inhabitants, murdered all the males in the city, married their wives and daughters, and rendered themselves masters of the place. After this violence they assumed the name of Mamertini, and called their city Mamertum, or Mamertium, from a provincial word which in their language signified *martial* or *warlike*. The Mamertines were afterwards defeated by Hiero, and totally disabled to repair their ruined affairs.

MAMMÆ, in anatomy. See there, n° 112.

MAMMALIA, in natural history, the first class of animals in the Linnæan system, divided into seven orders. See ZOOLOGY.

MAMMEA, *MAMMEE-Tree*: A genus of the monogynia order, belonging to the polyandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is tetrapetalous; the calyx diphyllous; the berry very large and tetraspermous. There are two species; both of them large evergreen trees of the hot parts of America and Asia, and retained here in hot-houses for variety; both of them adorned with large, oval, oblong, stiff leaves, and large quadripetalous flowers, succeeded by large round eatable fruit of a most exquisitely rich flavour. They are propagated by seed, which is to be sowed in small pots of light earth, and plunged in the bark-bed, where they will soon come up; give gentle waterings, and about August transplant them into separate pots a size larger, plunging them into the bark-bed, and giving shade and water till fresh-rooted. In this country they must never be taken out of the stove.

MAMMON, the god of riches, according to some authors; though others deny that the word stands for such a deity, and understand by it only *riches* themselves. Our Saviour says, *We cannot serve God and mammon*; that is, be religious and worldly-minded at the same time. Our poet Milton, by poetic licence, makes Mammon to be one of the fallen angels, and gives us his character in the following lines:

Mammon, the least erected spirit that fell
From heav'n: for ev'n in heav'n his looks and thoughts
Were always downward bent; admiring more
The riches of heav'n's pavement, trodden gold,
Than ought divine or holy else enjoy'd
In beatific vision: by him first
Man also, and by his suggestion taught,
Ransack'd the centre, and with impious hands
Rifled the bowels of their mother earth,
For treasures better hid. Soon had his crew
Open'd into the hill a spacious wound,
And digg'd out ribs of gold. Let none admire
That riches grow in hell; that soil may best
Deserve the precious bane.

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MAMMOTH, or MAMMUTH, the name of a huge Mammoth. animal now unknown, to which are said to have belonged those tusks, bones, and skeletons of vast magnitude, which have been frequently found in different parts of Siberia, as well in the mountains as the valleys; likewise in Russia, Germany, and North America. Many specimens of them may be seen in the Imperial cabinet at Petersburg; in the British, Dr Hunter's, and the late Sir Ashton Lever's museums, and in that of the Royal Society. A description of the mammoth is given by Muller in the *Recueil des Voyages au Nord*. "This animal, he says, is four or five yards high, and about 30 feet long. His colour is greyish. His head is very long, and his front very broad. On each side, precisely under the eyes, there are two horns, which he can move and cross at pleasure. In walking he has the power of extending and contracting his body to a great degree." Isbrandes Ides gives a similar account; but he is candid enough to acknowledge, that he never knew any person who had seen the mammoth alive. Mr Pennant, however, thinks it "more than probable, that it still exists in some of those remote parts of the vast new continent, impenetrated yet by Europeans. Providence (he adds) maintains and continues every created species; and we have as much assurance, that no race of animals will any more cease while the earth remaineth, than *seed-time and harvest, cold and heat, summer and winter, day and night*." The Ohio Indians have a tradition handed down from their fathers respecting these animals, "That in ancient times a herd of them came to the Big-bone Licks, and began an universal destruction of the bears, deer, elks, buffaloes, and other animals which had been created for the use of the Indians: that the Great Man above, looking down and seeing this, was so enraged that he seized his lightning, descended to the earth, seated himself upon a neighbouring mountain on a rock, on which his seat and the print of his feet are still to be seen, and hurled his bolts among them till the whole were slaughtered, except the big bull, who presenting his forehead to the shafts, shook them off as they fell; but at length missing one, it wounded him in the side; whereon, springing round, he bounded over the Ohio, the Wabash, the Illinois, and finally over the great lakes, where he is living at this day."

Several eminent naturalists, as Sir Hans Sloane, Gmelin, Daubenton, and Buffon, are of opinion that these prodigious bones and tusks are really the bones and tusks of elephants, and many modern philosophers have held the mammoth to be as fabulous as the centaur. The great difference in size they endeavour to account for as arising from difference in age, sex, and climate; and the cause of their being found in those northern parts of the world where elephants are no longer natives, nor can even long exist, they presume to have arisen from hence; that, in the great revolutions which have happened in the earth, the elephants, to avoid destruction, have left their native country, and dispersed themselves wherever they could find safety. Their lot has been different. Some in a longer and others in a shorter time after their death, have been transported to great distances by some vast inundations. Those, on the contrary, which survived, and wandered far to the north, must necessarily have

Mammoth. fallen victims to the rigour of the climate. Others, without reaching to so great a distance, might be drowned, or perish with fatigue. In the year 1767, Dr Hunter, with the assistance of his brother Mr J. Hunter, had an opportunity of investigating more particularly this part of natural history, and has evidently proved, that these fossil bones and tusks are not only larger than the generality of elephants, but that the tusks are more twisted, or have more of the spiral curve, than elephants teeth; and that the thigh and jaw bones differ in several respects from those of the elephant: but what put the matter beyond all dispute was the shape of the grinders, which clearly appeared to belong to a carnivorous animal, or at least to an animal of the mixed kind; and to be totally different from those of the elephant, which is well known not to be of the carnivorous, but graminivorous kind, both by the form of its grinders and by its never tasting animal food.—Some have supposed these fossil bones to belong to the hippopotamus or river-horse; but there are many reasons against this supposition, as the hippopotamus is even much smaller than the elephant, and has such remarkably short legs, that his belly reaches within three or four inches of the ground.

† *Notes on the State of Virginia,* p. 65.

North America seems to be the quarter where the remains in question most abound. On the Ohio, and in many parts farther north, tusks, grinders, and skeletons of unparalleled magnitude, which can admit of no comparison with any animal at present known, are found in vast numbers, some lying on the surface of the earth, and some a little below it. A Mr Stanley, taken prisoner by the Indians near the mouth of the Tanissee, relates, as Mr Jefferson† informs us, that after being transferred through several tribes, from one to another, he was at length carried over the mountains west of the Missouri to a river which runs westwardly; that these bones abounded there; and that the natives described to him the animal to which they belonged as still existing in the northern parts of their country; from which description he judged it to be an elephant. Bones of the same kind have been lately found some feet below the surface of the earth, in salines opened on the North Holston, a branch of the Tanissee, about the latitude of $36\frac{1}{2}^{\circ}$ N. Instances are mentioned of like animal remains found in the more southern climates of both hemispheres: but Mr Jefferson observes, “they are either so loosely mentioned, as to leave a doubt of the fact; so inaccurately described, as not to authorise the classing them with the great northern bones; or so rare, as to found a suspicion that they have been carried thither as curiosities from more northern regions. So that, on the whole, there seem to be no certain vestiges of the existence of this animal farther south than the salines last mentioned. It is remarkable (continues he) that the tusks and skeletons have been ascribed by the naturalists of Europe to the elephant, while the grinders have been given to the hippopotamus or river-horse. Yet it is acknowledged, that the tusks and skeletons are much larger than those of the elephant, and the grinders many times greater than those of the hippopotamus, and essentially different in form. Wherever these grinders are found, there also we find the tusks and skeleton; but no skeleton of the hippopotamus nor grinders of

the elephant. It will not be said that the hippopotamus and elephant came always to the same spot, the former to deposit his grinders, and the latter his tusks and skeleton. For what became of the parts not deposited there? We must agree, then, that these remains belong to each other; that they are of one and the same animal; that this was not a hippopotamus, because the hippopotamus had no tusks nor such a frame, and because the grinders differ in their size as well as in the number and form of their points. That it was not an elephant, I think ascertained by proofs equally decisive. I will not avail myself of the authority of the celebrated anatomist*, who, from an examination of the form and structure of the tusks, has declared they were essentially different from those of the elephant; because another anatomist†, equally celebrated, has declared, on a like examination, that they are precisely the same. Between two such authorities I will suppose this circumstance equivocal. But, 1. The skeleton of the mammoth (for so the incognitum has been called) bespeaks an animal of five or six times the cubic volume of the elephant, as M. de Buffon has admitted. 2. The grinders are five times as large, are square, and the grinding surface studded with four or five rows of blunt points: whereas those of the elephant are broad and thin, and their grinding surface flat. 3. I have never heard an instance, and suppose there has been none, of the grinder of an elephant being found in America. 4. From the known temperature and constitution of the elephant, he could never have existed in those regions where the remains of the mammoth have been found. The elephant is a native only of the torrid zone and its vicinities: if, with the assistance of warm apartments and warm clothing, he has been preserved in life in the temperate climates of Europe, it has only been for a small portion of what would have been his natural period, and no instance of his multiplication in them has ever been known. But no bones of the mammoth, as I have before observed, have been ever found further south than the salines of the Holston, and they have been found as far north as the Arctic circle. Those, therefore, who are of opinion that the elephant and mammoth are the same, must believe, 1. That the elephant known to us can exist and multiply in the frozen zone; or, 2. That an internal fire may once have warmed those regions, and since abandoned them, of which, however, the globe exhibits no unequivocal indications; or, 3. That the obliquity of the ecliptic, when these elephants lived, was so great as to include within the tropics all those regions in which the bones are found; the tropics being, as is before observed, the natural limits of habitation for the elephant. But if it be admitted that this obliquity has really decreased, and we adopt the highest rate of decrease yet pretended, that is, of one minute in a century, to transfer the northern tropic to the Arctic circle, would carry the existence of these supposed elephants 250,000 years back; a period far beyond our conception of the duration of animal bones left exposed to the open air, as these are in many instances. Besides, though these regions would then be supposed within the tropics, yet their winters would have been too severe for the sensibility of the elephant. They would have had, too, but one day and one night in

* Hunter.

† D'Aubenton.

Mammoth,
Mamre.

in the year; a circumstance to which we have no reason to suppose the nature of the elephant fitted. However, it has been demonstrated, that if a variation of obliquity in the ecliptic takes place at all, it is vibratory, and never exceeds the limits of nine degrees, which is not sufficient to bring these bones within the tropics. One of these hypotheses, or some other equally arbitrary and inadmissible to cautious philosophy, must be adopted to support the opinion that these are the bones of the elephant. For my own part, I find it easier to believe that an animal may have existed, resembling the elephant in his tusks and general anatomy, while his nature was in other respects extremely different. From the 30th degree of south latitude to the 30th of north, are nearly the limits which nature has fixed for the existence and multiplication of the elephant known to us. Proceeding thence northwardly to 36½ degrees, we enter those assigned to the mammoth. The further we advance north, the more their vestiges multiply as far as the earth has been explored in that direction; and it is as probable as otherwise, that this progression continues to the pole itself, if land extends so far. The centre of the frozen zone then may be the acmé of their vigour, as that of the torrid is of the elephant. Thus nature seems to have drawn a belt of separation between these two tremendous animals, whose breadth indeed is not precisely known, though at present we may suppose it about 6½ degrees of latitude; to have assigned to the elephant the regions south of these confines, and those north to the mammoth, founding the constitution of the one in her extreme of heat, and that of the other in the extreme of cold. When the Creator has therefore separated their nature as far as the extent of the scale of animal life allowed to this planet would permit, it seems perverse to declare it the same, from a partial resemblance of their tusks and bones. But to whatever animal we ascribe these remains, it is certain such a one has existed in America, and that it was the largest of all terrestrial beings of which any traces have ever appeared."

MAMRE, an Amorite, brother of Aner and Eschol, and friend of Abraham (Gen. xiv. 13.). It was with these three persons, together with his own and their domestics, that Abraham pursued and overcame the kings after their conquest of Sodom and Gomorrah. This Mamre, who dwelt near Hebron, communicated his name to great part of the country round about. Hence we read (ch. xiii. 18. xxiii. 17, &c.), that Abraham dwelt in Mamre and in the plain of Mamre. But it is observed, that what we translate the *plain* should be rendered the *oak*, of Mamre, because the word

elon signifies an *oak* or *tree of a long duration*. Sozomen tells us, that this tree was still extant, and famous for pilgrimages and annual feasts, even in Constantine's time; that it was about six miles distant from Hebron; that some of the cottages which Abraham built were still standing near it; and that there was a well likewise of his digging, whereunto both Jews, Christians, and Heathens, did at certain seasons resort, either out of devotion or for trade, because there was held a great mart. To these superstitions Constantine the Great put a stop.

MAN, the head of the animal creation, is a being who feels, reflects, thinks, contrives, and acts; who has the power of changing his place upon the earth at pleasure; who possesses the faculty of communicating his thoughts by means of speech; and who has dominion over all other creatures on the face of the globe. Animated and enlightened by a ray from the Divinity, he surpasses in dignity every material being. He spends less of his time in solitude, than in society and in obedience to those laws which he himself has framed.

In the *Systema Naturæ*, MAN (*Homo*) is ranked as a distinct genus of the order *Primates*, or "Chiefs," belonging to the *Mammalia* class of animals, or those which nourish their young by means of lactiferous teats or paps. Of this genus he is the only species (A); and denominated *Sapiens*, as being endowed with wisdom far superior to, or rather in exclusion of, all other animals—He *varies*, from climate, education, and habits; and the following varieties, exclusive of

wild men (B), are enumerated by Linnæus. *α Americans*. "Of copper-coloured complexion, choleric constitution, and remarkably erect."—Their hair is black, lank, and coarse; their nostrils are wide; their features harsh, and the chin is scantily supplied with beard. Are obstinate in their tempers, free and satisfied with their condition; and are regulated in all their proceedings by traditional customs.—Paint their skin with red streaks.

β Europeans. "Of fair complexion, sanguine temperament, and brawny form."—The hair is flowing, and of various shades of brown; the eyes are mostly blue.—They are of gentle manners, acute in judgment, of quick invention, and governed by fixed laws.—Dress in close vestments.

γ Asiatics. "Of sooty complexion, melancholic temperament, and rigid fibre."—The hair is strong, black, and lank; the eyes are dark brown.—They are of grave, haughty, and covetous manners; and are governed by opinions.—Dress in loose garments.

δ, Africans. "Of black complexion, phlegmatic

3 S 2

tempe-

(A) In the early editions of Linnæus, the *Troglodytes* was added as another species; but is now more properly ranked under the genus *Simia*. See *SIMIA*.

(B) *HOMINES Feri*; described as walking on all-fours, as being dumb, and as covered with hair.—1. A youth found in Lithuania, in 1761, resembling a bear. 2. A youth found in Hesse, in 1544, resembling a wolf. 3. A youth in Ireland resembling a sheep, (*Tulp. Obs.* iv. 9.) 4. A youth in Bamberg resembling an ox, (*Camerarius*.) 5. A wild youth found in 1724 in Hanover. 6. Wild boys found in 1719 in the Pyrenees. 7. A wild girl found in 1717 in Overysel. 8. A wild girl found in 1731 in Champagne. 9. A wild lad found near Leyden, (*Boerhaave*.)—These instances of wild men and their similitudes, according to Mr Kerr †, are partly to be attributed to imposture, and in part to exaggeration: Most probably (he thinks) idiots who had strayed from their friends, and who resembled the above animals only in imitating their voices.

† Translation of the Animal kingdom of Linnæus, p. 44. note.

General definition and character of man.

2 Varieties of man, according to Linnæus, (*Syst. Nat.* edit. 13. Gmelin, p. 22.)

Man.
+ A doubtful circumstance.

temperament, and relaxed fibre."—The hair is black and frizly; the skin soft and silky; the nose flat; the lips are thick; and the female has a natural apron†, and long lax breasts.—They are of crafty, indolent, and careless dispositions, and governed in their actions by caprice.—Anoint the skin with grease.

3. *Monsters.* Of these there are several varieties; the first and second of which, in the following list, are occasioned by peculiarity of climate, while the rest are produced by artificial management. 1. *Alpini*; The inhabitants of the northern mountains: they are small in stature, active and timid in their dispositions. 2. *Patagonici*: The Patagonians of South America; of vast size, and indolent in their manners. 3. *Monorchides*: The Hottentots; having one testicle extirpated. 4. *Imberbes*: Most of the American nations; who eradicate their beards and the hair from every part of the body except the scalp. 5. *Macrocephali*: The Chinese; who have their heads artificially forced into a conical form. 6. *Plagiocephali*: The Canadian Indians; who have the fore part of their heads flattened, when young, by compression.

3. Gmelin's arrangement, (not in loc. ubi supra.)

The following arrangement of the varieties in the human species, is offered by Dr Gmelin as more convenient than that of Linnæus.

1. White, a: (*Hom. Albus.*) Formed by the rules of symmetrical elegance and beauty; or at least what we consider as such.—This division includes almost all the inhabitants of Europe; those of Asia on this side of the Oby, the Caspian, Mount Imaus, and the Ganges; likewise the natives of the north of Africa, of Greenland, and the Esquimaux.

b, Brown: (*Hom. Badius.*) Of a yellowish brown colour; has scanty hairs, flat features, and small eyes.—This variety takes in the whole inhabitants of Asia not included in the preceding division.

c. Black: (*Hom. Niger.*) Of black complexion; has frizly hair, a flat nose, and thick lips.—The whole inhabitants of Africa, excepting those of its more northern parts.

d, Copper-coloured: (*Hom. Cupreus.*) The complexion of the skin resembles the colour of copper not burnished.—The whole inhabitants of America, except the Greenlanders and Esquimaux.

e, Tawny: (*Hom. Fuscus.*) Chiefly of a dark blackish-brown colour; having a broad nose, and harsh coarse straight hair.—The inhabitants of the southern islands, and of most of the Indian islands.

The following is Linnæus's description of *Man*, as translated by Mr Kerr.

4. Zoological description of man.

"The Body, which seldom reaches six feet in height, is erect, and almost naked, having only some scattered distant hairs, except in some small spots to be afterwards noticed, and when first born is entirely naked. The Head is shaped like an egg; the scalp being long, and covered with hair; the forehead broad; the top of the head flat; and the hind-head protuberant. The Face is naked, having the brow or forehead flattened and quadrangular; the temples are compressed, with peaked angles pointing upwards and backwards towards the hairy scalp. The eye-brows are prominent, and covered with hairs which, shedding outwards, cover each other like tiles; and between the inner extremities of the two eye-brows, there is a smooth, shallow furrow or depression, in a

line with the nose. The upper eye-lid is moveable, but the lower one hardly moves, and both are planted at their edges with a row of stiff recurved hairs, named *eye-lashes*. The eye-balls are round, having no suspending muscle as in those of most quadrupeds; the pupil, or opening of the sight, is circular; and the eye has no *membrana nictitans*. The upper parts of the cheeks are prominent, softish, and coloured with a red blush; their outer parts flattened; the lower parts are hollowed, lax, and expansile. The nose is prominent, and compressed at the sides; its extremity or point is higher than the rest, and blunt; the nostrils are oval, open downwards, with thickened edges, and are hairy on their insides. The upper lip is almost perpendicular, and is furrowed on the middle, from the division between the nostrils to the edge of the lip; the under lip is erect, thicker and more prominent than that above; both have a smooth red protuberance, surrounding the mouth at their edges. The chin is prominent, blunt, and gibbous. In males, the face all round the mouth is covered with hair, called the *beard*, which first appears about puberty, in patches on the chin. The teeth in both jaws may be distinguished into three orders; the *fore-teeth* are erect, parallel, and wedge-like, of the kind named *incisors*, or *cutting-teeth*; they stand close to each other, and are more equal and rounder than in other animals; the *tusks*, called in man *eye-teeth* and *corner-teeth*, of which there is only one on each side of the fore-teeth in each jaw, are a little longer than the fore-teeth, but much less so than in other animals, and they are placed close to the other teeth; the *grinders*, of which there are five on each side in both jaws, are blunt, and divided on their upper surface into pointed eminences; but these are not so remarkable as in other animals. The ears are placed on the sides of the head, are of an oblong rounded figure, with a semilunar bend on their anterior edges; they lie flat to the head, are naked, arched at the margin on their upper and posterior edges, and are thicker and soft at the under extremities.

"The Trunk of the body consists of the neck, breast, back, and belly. The Neck is roundish, and shorter than the head; its vertebræ, or chine bones, are not, as in most animals, connected by a suspensory ligament; the nape is hollowed; the throat, immediately below the chin, is hollowed at its upper part, and protuberant in the middle a little lower down. The Breast is somewhat flattened both before and behind; on the fore-part there is a cavity or depression where it joins with the neck; the arm-pits are hollow and hairy; the pit of the stomach is flat: On the breast are two distant, round, protuberant mammæ, or dugs, each having a cylindrical obtuse wrinkly projecting nipple, which is surrounded by a darker coloured circle called the *areola*. The Back is flat, having protuberances on each side at the shoulder-blades, with a furrow or depression between them. The Abdomen or belly is large and protuberant, with a hollow at the navel; the epigastric region, or situation of the stomach, is flat; the hypogastric regions, or sides of the belly, are protuberant; the groins flattish and hollowed. The pubes is hairy; the pelvis, or basin, is wider above, and grows narrower below. The male parts are external and loose; the penis cylindrical; the scrotum

Man.

Man. scrotum roundish, lax, and wrinkled, being divided in the middle by a longitudinal ridge or smooth line, which extends along the whole perinæum: The female parts are compressed and protuberant, having labia, nymphæ, clytoris, and hymen; and, in adults, secreting the catamenia. There is no external tail.

"The Limbs consist of arms and hands instead of fore-legs; and of thighs, legs, and feet. The Arms are placed at a distance from each other; they are round, and about a foot in length from the joint of the shoulder to the elbow; the fore-arm, or cubit, contains two bones, and is obtusely prominent: the *ulna*, which forms the principal thickness of the member, is round, and somewhat flattened on the inside. The Hands are broad, flat, and rounded; convex on the outside or back of the hand, and concave on the inside or palm. Each hand has five fingers, one of which, named the *thumb*, is shorter and thicker than the rest, and is placed at some distance from them; the others are near each other, and placed parallel, the outer or *little-finger* being the smallest; the second, named *index* or *fore-finger*, and the fourth, called the *ring-finger*, are next in length and in size; and the third, or *middle-finger*, is the longest; the point of this last, when the arm and hand hang down, reaches to the middle of the thigh. The nails are rounded and oval, being flatly arched, or convex upwards, and each has a semilunar whitish mark at the root or lower extremity.

"The lower limbs are placed close together, having brawny muscular haunches and swelling fleshy hips; the knees are obtuse, bend forwards, and have hollow hams behind. The Legs, which are nearly of the same length with the thighs, are of a muscular make behind, where they swell out into what is called the *calf*; they are lean, and free of flesh on the shins or fore-parts, and taper downwards to the ankle, which have hard hemispherical projections on each side, named the *ankle-bones* or *malleolæ*. The heel is thick, prominent, and gibbous, being longer and broader than in other animals, for giving a firm support to the body; it joins immediately with the sole of the foot. The Feet are oblong, convex above, and flattened on the soles, which have a transverse hollow about the middle. Each foot has five toes, somewhat bent downwards, and gibbous or swelled underneath at their extremities; they are all placed close together, the inner or great-toe being thicker and somewhat shorter than the rest; the second and third are nearly of equal length; and the fourth and fifth are shorter than the others, the last mentioned or little toe being the shortest and smallest. The toe nails resemble those on the fingers, which are already described.

"Thus man differs from the other animals in his erect posture and naked skin, having a hairy scalp, being furnished with hair on the eye-brows and eyelashes, and having, when arrived at puberty, the pubes, breast, arm-pits, and the chin of the males, covered with hair. His brain is larger than that of any other animal, even the most enormous; he is provided with an *uvula*, and has organs of speech. His face is placed in the same parallel line with his body; he has a projecting compressed nose, and a prominent chin. His feet in walking rest on the heel. He has no tail; and, lastly, the species is distinguished from other animals

by some peculiarities of the female constitution, which have been already mentioned."

Nosce Teipsum, "Know thyself," is a precept worthy of the lawgiver of Athens: it has been called the first step to wisdom, and was formerly written on letters of gold in the temple of Diana. In the pursuit of this important branch of knowledge, MAN may be contemplated in the seven following respects:

1. PHYSIOLOGICALLY,—as a frail machine, chiefly composed of nerves and fibres interwoven with each other. His most perfect state is during youth; and he is endowed with faculties more numerous, and in higher perfection, than those of all other animals.

"Man, intended for exercising dominion over the whole animal creation, is sent by Nature into the world naked, forlorn, and bewailing his lot; he is then unable to use his hands or feet, and is incapable of acquiring any kind of knowledge without instruction; he can neither speak, nor walk, nor eat, nor perform any action whatever by natural instinct." *Pliny*.—"We may judge what kind of life is allotted to us by Nature, since it is ordained, as an omen, that we should come weeping into the world:" *Seneca*.—"It is humiliating to the pride of man, to consider the pitiable origin of this most arrogant of all the animals:" *Pliny*.

2. DIETETICALLY.—*Cura valetudinem*. Bodily health and tranquillity of mind are more to be desired than all the riches, pomp, or glory, of a Cræsus, a Solomon, or an Alexander. Health is to be preserved by moderation, it is destroyed by abstinence, injured by variety of delicacies, weakened by unusual things, and strengthened by the use of proper and accustomed fare. Man, learned in the pernicious art of cookery, is fond of many dishes, rendered palatable by the injurious effects of fire, and by the baneful addition of wine. "Hunger is satisfied with a small quantity of food, luxury demands overabundance. Imagination requires vast supplies; while nature is contented with a moderate quantity of ordinary food, and is burthened by superfluity:" *Seneca*.—According as thou livest, so shall thy life be enjoyed.

3. PATHOLOGICALLY.—*Memento mori!* The life of man resembles a bubble ready to burst; his fate is suspended by a hair, and is dependent on the uncertain lapse of time. "The earth contains nothing more frail than man:" *Homer*.—"Nothing is weaker than human life: To what dangers, and to how many diseases, is it not exposed? Hence the whole period of a man's life is but a span: Half of it is necessarily spent in a state resembling death; without including the years of infancy, wherein there is no judgment; or the period of old age, fertile in sufferings, during which the senses are blunted, the limbs become stiff, and the faculties of sight and hearing, the powers of walking, and the teeth, the instruments of nourishment, fail before the rest of the body:" *Pliny*.—"Thus a considerable part of death is suffered during life; and death possesses all that belonged to the times which are past. Finally, nature will speedily recal and destroy all the beings which thou seest, and all that thy imagination can suppose to exist hereafter; for death calls equally upon all, whether they be good or whether they be evil:" *Seneca*, ii. 59.

4. NATURALLY.—*Innocui vivite, Numen adest!* Man, the prince of animated beings, who is a miracle of nature,

Man.

5
Self-know-
ledge, or
the study of
man. (*Syst.*
Nat. Kerr.)

Man.

ture, and for whom all things on this earth were created, is a mimic animal, weeping, laughing, singing, speaking; tractable, judicious, inquisitive, and most wise; he is weak and naked, unprovided with natural weapons, exposed to all the injuries of fortune, needful of assistance from others, of an anxious mind, solicitous of protection, continually complaining, changeable in temper, obstinate in hope, and slow in the acquisition of wisdom. He despises the time which is past, abuses that which is present, and sets his affections on the uncertain future; thus continually neglecting winged time, which, though infinitely precious, can never be recalled: For thus the best and readiest time, in every age, flies on with miserable mortals; some it summons to attend their daily and burthensome labours; some it confines to luxurious inaction, pampered even to suffocation with superfluities; some it solicits in the ever restless paths of ambition; some it renders anxious for the acquisition of wealth, and distresses by the possession of the thing desired; some it condemns to solitude, and others to have their doors continually crowded with visitors; here one bewails the conduct of his children, there one grieves their loss. Tears will sooner fail us than their causes, which only oblivion can remove. "On every hand our evils overbalance our advantages; we are surrounded with dangers; we rush forwards into untried situations; we are enraged without having received provocation; like wild beasts, we destroy those we do not hate; we wish for favourable gales, which lead us only to destruction; the earth yawns wide, ready for our death:" *Seneca*.—"Other animals unite together against enemies of a kind different from their own, while man suffers most injuries from his own species:" *Pliny*.

5. POLITICALLY.—*Esse antiqua virtute et fide!* Man, instead of following that which is right, is subjected to the guidance of manifest error; this envelopes all his faculties under the thick veil of custom, as soon as he is born; according to its dictates he is fed, educated, brought up, and directed, in all things; and by its arbitrary rules his honesty, fortitude, wisdom, morality, and religion, are judged of; thus, governed by opinion, he lives conformably to custom, instead of being guided by reason. Though sent into the world a perishable being, for all are evidently born to suffer, instead of endeavouring to secure those things which are most advantageous and truly beneficial, he, infatuated by the smiles of fortune, anxiously collects her gaudy trifles for future enjoyment, and neglects her real benefits; he is driven to madness by envious snarlers; he persecutes with hatred the truly religious for differing from himself in speculative opinions; he excites numberless broils, not that he may do good, but for a purpose that even himself is ignorant of. He wastes his precious and irrecoverable time in trifles; he thinks lightly of immortal and eternal concerns, while regulating the succession of his posterity; and perpetually entering on new projects, forgetful of his real condition, he builds palaces instead of preparing his grave; till at length, in the midst of his schemes, death seizes him; and then, first opening his eyes, he perceives, O man! that all is delusion. "Thus we live as if immortal, and first learn in death that we have to die:" *Seneca*.

Man.

6. MORALLY.—*Benefac et latere!* Man is composed of an animated medullary substance, which prompts him to that which is right; and of a bodily frame liable to impressions, which instigates him to the enjoyment of pleasure. In his natural state he is foolish, wanton, an inconsiderate follower of example, ambitious, profuse, dissatisfied, cunning, peevish, invidious, malicious, and covetous; by the influence of just morals he is transformed to be attentive, chaste, considerate, modest, temperate, quiet, sincere, mild, beneficent, grateful, and contented. "Sorrow, luxury, ambition, avarice, the desire of life, and anxiety for the future, are common to all animals:" *Pliny*.

7. THEOLOGICALLY.—*Memento Creatoris tui!* Man, the ultimate purpose of creation, and masterpiece of the works of Omnipotence, was placed on earth that he might contemplate its perfections; he was endowed with sapient reason, and made capable of forming conclusions from the impressions of his senses, that, from a consideration of created objects, he might know their Creator as the Almighty, the Infinite, the Omniscient, the Eternal God: That we may live morally under his governing care, it is requisite that we have a thorough conviction of its existence, and must have it ever in remembrance. Other revealed matters on this subject are left to be explained by the theologians.

"There are two things which lead to a knowledge of God; creation and revelation:" *Augustine*.—"God, therefore, may be found out by the light of nature, but is only to be known by the assistance of doctrine:" *Tertullian*.—"Man alone has the inestimable privilege of contemplating the perfections of God, who is the author both of nature and of revelation:" *Ibid*.—"Learn that God has both ordered you to exist, and that you should study to act that part properly which is allotted for you in life:" *Perf. Sat. iii. 71*.

The whole of this ENCYCLOPÆDIA may in some respect be accounted an analysis of MAN; as comprehending his knowledge of God, of himself, and of natural and artificial objects. In the sequel of this article we shall collect into one view the most important particulars relating to himself individually, considered as a physical being, and as forming a subject of natural history.

Anatomists have employed much pains in the study of the material part of man, and of that organization which determines his place in the animal creation. From tracing and combining his different external parts; from observing that his body is in some places covered with hair; that he can walk upon his hands and his feet at the same time, in the manner of quadrupeds; that, like certain animals which hold their food in their paws, he has two clavicles; that the female brings forth her young alive, and that her breasts are supplied with milk: from these circumstances we might be led to assign man a place in the class of viviparous quadrupeds. But, in our opinion, such an arrangement would be defective, arbitrary, and absurd. Man is not a quadruped †: Of all the animals, he alone can support himself, continually and without restraint, in an erect posture (that is, with his head and body in a vertical line upon his legs). In this majestic and dignified attitude, he can change his place, survey this earth which he inhabits, and turn his eyes towards the vault of heaven. By a noble and easy gait, he preserves

6
Natural history of Man.

† See Comparative Anatomy, Sect. i. ii.

Man.

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preserves an equilibrium in the several parts of his body, and transports himself from one place to another with different degrees of celerity (c). To man alone nature has denied a covering; but still he is her masterpiece, the last work which came from the hands of the Almighty Artist, the sovereign and the chief of animals,

(c) M. Daubenton, after a careful examination of those characters in the form of man by which he is distinguished from other animals, has reduced them to two heads. The first is the strength of the muscles of the legs, by which the body is supported in a vertical position above them; the second consists in the articulation of the head with the neck by the middle of its base.

We stand upright, bend our body, and walk, without thinking on the power by which we are supported in these several positions. This power, says M. Daubenton, resides chiefly in the muscles, which constitute the principal part of the calf of the leg. Their exertion is felt, and their motion is visible externally when we stand upright and bend our body backwards and forwards. This power is no less great when we walk even on an horizontal plane. In ascending a height, the weight of the body is more sensibly felt than in descending. All these motions are natural to man. Other animals, on the contrary, when placed on their hind legs, are either incapable of performing them at all, or do it partially, with great difficulty, and for a very short time. The *gibbon*, and the *jocko* or *ourang-outang*, are the animals most resembling man in their construction: they can stand upright with much less difficulty than other brutes; but the restraint they are under in this attitude plainly shows that it is not natural to them. The reason is, that the muscles in the back part of the leg in the gibbon and the jocko are not, as in man, sufficiently large to form a calf, and consequently not sufficiently strong to support the thighs and body in a vertical line, and to preserve them in that posture.

M. Daubenton has discovered, that the attitudes proper to man and to the animals are pointed out by the different manners in which the head is articulated with the neck. The two points, by which the osseous part of the head is connected with the first vertebra of the neck, and on which every movement of the head is made with the greatest facility, are placed at the edge of the great foramen of the occipital bone, which in man is situated near the centre of the base of the cranium, affords a passage for the medullary substance into the vertebræ, and determines the place of the articulation of the head with the neck. The body and neck being, according to the natural attitude, in a vertical direction, the head must be placed in equilibrium upon the vertebræ as upon a pivot or point of support. The face is on a vertical line, almost parallel to that of the body and neck. The jaws, which are very short compared with those of most other animals, extend very little farther forwards than the forehead.

No animal has, like man, its hind legs as long as the body, neck, and head, taken together, measuring from the top of the head to the os pubis.

In the frame of the human body the principal parts are nearly the same with those of other animals; but in the connection and form of the bones, says M. Daubenton, there is as great a difference as in the attitudes proper to each. Were a man to assume the natural posture of quadrupeds, and try to walk by the help of his hands and feet, he would find himself in a very unnatural situation; he could not move his feet and head but with the greatest difficulty and pain; and let him make what exertions he pleased, he would find it impossible to attain a steady and continued pace. The principal obstacles he would meet with would arise from the structure of the pelvis, the hands, the feet, and the head.

The plane of the great occipital foramen, which in man is almost horizontal, puts the head in a kind of equilibrium upon the neck when we stand erect in our natural attitude: but when we are in the attitude of quadrupeds, it prevents us from raising our head so as to look forwards, because the movement of the head is stopped by the protuberance of the occiput, which then approaches too near the vertebræ of the neck.

In most animals, the foramen magnum of the occipital bone is situated at the back part of the head; the jaws are very long; the occiput has no protuberance beyond the aperture, the plane of which is in a vertical direction, or inclined a little forwards or backwards; so that the head is pendant, and joined to the neck by its posterior part. This position of the head enables quadrupeds, though their bodies are in a horizontal direction, to present their muzzle forwards, and to raise it so as to reach above them, or to touch the earth with the extremity of their jaws when they bring their neck and head down to their feet. In the attitude of quadrupeds, man could touch the earth only with the fore part or the top of the head.

To these differences of structure, M. Daubenton adds, that when man is standing, his heel rests upon the earth as well as the other parts of his foot; when he walks it is the first part which touches the ground; man can stand on one foot: these are peculiarities in structure and in the manner of moving which are not to be found in other animals. We may therefore conclude that man cannot be ranked in the class of quadrupeds. We may add, that in man the brain is much larger, and the jaws much shorter, than in any other animal. The brain, by its great extent, forms the protuberance of the occipital bone, the forehead, and all that part of the head which is above the ears. In animals, the brain is so small, that most of them have no occiput, or the front is either wanting or little raised. In animals which have large foreheads, such as the horse, the ox, the elephant, &c. they are placed as low, and even lower, than the ears. These animals likewise want the occiput, and the top of the head is of very small extent. The jaws, which form the greatest portion of the muzzle, are large in proportion to the smallness of the brain. The length of the muzzle varies in different animals: in solipede animals it is very long; it is short in the ourang-outang; and in man it does not exist at all. No beard grows on the muzzle: this part is wanting in every animal.

Man.

mals, a world in miniature, the centre which connects the universe together. The form of his body, the organs whereof are constructed in such a manner as to produce a much greater effect than those of other animals, announces his power. Every thing demonstrates the excellence of his nature, and the immense distance placed by the bounty of the Creator between man and beast. Man is a reasonable being; brute animals are deprived of that noble faculty. The weakest and most stupid of the human race is able to manage the most sagacious quadruped; he commands it, and makes it subservient to his use. The operations of brutes are purely the effect of mechanical impulse, and continue always the same; human works are varied without end, and infinitely diversified in the manner of execution. The soul of man is free, independent, and immortal. He is fitted for the study of science, and the cultivation of art; he has the exclusive privilege of examining every thing which has existence, and of holding communication with his fellow-creatures by language, by particular motions of the body, and by marks and characters mutually agreed upon. Hence arises that physical pre-eminence which he enjoys over all animals; and hence that power which he possesses over the elements, and (so to speak) over nature itself. Man, therefore, is unequalled in his kind; but the individuals thereof differ greatly from one another in figure, stature, colour, manners, and dispositions. The globe which man inhabits is covered with the productions of his industry and the works of his hands: it is his labour, in short, which gives a value to the whole terrestrial mass.

The history of man is an object of attention highly interesting, whether we consider him in the different periods of his life, or take a view of the varieties of the species, or examine the wonderful organization of his frame. We shall, therefore, attempt to give a short sketch of him in these different points of view; referring occasionally to other parts of the work for more particular details.

7
Different
periods of
man's life.

"Nothing (says M. Buffon) exhibits such a striking picture of our weakness, as the condition of an infant immediately after birth. Incapable of employing its organs, it needs assistance of every kind. In the first moments of our existence, we present an image of pain and misery, and are more weak and helpless than the young of any other animal. At birth, the infant passes from one element to another: When it leaves the gentle warmth of the tranquil fluid by which it was completely surrounded in the womb of the mother, it becomes exposed to the impressions of the air, and instantly feels the effects of that active element. The air acting upon the olfactory nerves, and upon the organs of respiration, produces a shock something like sneezing, by which the breast is expanded, and the air admitted into the lungs. In the mean time, the agitation of the diaphragm presses upon the viscera of the abdomen, and the excrements are thus for the first time discharged from the intestines, and the urine from the bladder. The air dilates the vesicles of the lungs, and after being rarefied to a certain degree, is expelled by the spring of the dilated fibres reacting upon this rarefied fluid. The infant now respire; and articulates sounds, or cries. [For the condition of the *fetus in utero*

Nº 193.

8
His condi-
tion at
birth;

ro, where it lives without respiration, see ANATOMY, nº 110; and for the nature and importance of respiration, see nº 118.]

Most animals are blind for some days after birth. Infants open their eyes to the light the moment they come into the world; but they are dull, fixed, and commonly blue. The new-born child cannot distinguish objects, because he is incapable of fixing his eyes upon them. The organ of vision is yet imperfect; the cornea is wrinkled; and perhaps the retina is too soft for receiving the images of external objects, and for communicating the sensation of distinct vision. At the end of forty days, the infant begins to hear and to smile. About the same time it begins to look at bright objects, and frequently to turn its eyes towards the window, a candle, or any light. Now likewise it begins to weep; for its former cries and groans were not accompanied with tears. Smiles and tears are the effect of two internal sensations, both of which depend on the action of the mind. Thus they are peculiar to the human race, and serve to express mental pain or pleasure; while the cries, motions, and other marks of bodily pain and pleasure, are common to man and most of the other animals. Considering the subject as metaphysicians, we will find that pain and pleasure are the universal power which sets all our passions in motion.

The size of an infant born at the full time is commonly twenty-one inches; and that *fetus*, which nine months before was an imperceptible bubble, now weighs ten or twelve pounds, and sometimes more. The head is large in proportion to the body; and this disproportion, which is still greater in the first stage of the *fetus*, continues during the period of infancy. The skin of a new-born child is of a reddish colour, because it is so fine and transparent as to allow a slight tint of the colour of the blood to shine through. The form of the body and members is by no means perfect in a child soon after birth; all the parts appear to be swollen. At the end of three days, a kind of jaundice generally comes on, and at the same time milk is to be found in the breasts of the infant, which may be squeezed out by the fingers. The swelling decreases as the child grows up.

The liquor contained in the amnios leaves a viscid whitish matter upon the body of the child. In this country we have the precaution to wash the new-born infant only with warm water; but it is the custom with whole nations inhabiting the coldest climates, to plunge their infants into cold water as soon as they are born without their receiving the least injury. It is even said that the Laplanders leave their children in the snow till the cold has almost stopped their respiration, and then plunge them into a warm bath. Among these people, the children are also washed thrice a-day during the first year of their life. The inhabitants of northern countries are persuaded that the cold bath tends to make men stronger and more robust, and on that account accustom their children to the use of it from their infancy. The truth is, that we are totally ignorant of the power of habit, or how far it can make our bodies capable of suffering, of acquiring, or of losing.

The child is not allowed to suck as soon as it is born; but time is given for discharging the liquor and

Man.

9
and during
the period
of infancy.

slime

Man. slime from the stomach, and the *meconium* or excrement, which is of a black colour, from the intestines. As these substances might sour the milk, a little diluted wine mixed with sugar is first given to the infant, and the breast is not presented to it before ten or twelve hours have elapsed.

The young of quadrupeds can of themselves find the way to the teat of the mother: it is not so with man. The mother, in order to suckle her child, must raise it to her breasts; and, at this feeble period of life, the infant can express its wants only by its cries.

10
Peculiar
attention
requisite in
rearing the
young of
mankind.

New-born children have need of frequent nourishment. During the day, the breast ought to be given them every two hours, and during the night as often as they awake. At first they sleep almost continually; and they seem never to awake but when pressed by hunger or pain. Sleep is useful and refreshing to them; and it sometimes becomes necessary to employ narcotic doses, proportioned to the age and constitution of the child, for the purpose of procuring them repose. The common way of appeasing the cries of children is by rocking them in the cradle; but this agitation must be very gentle, otherwise a great risk is run of confusing the infant's brain, and of producing a total derangement. It is necessary to their being in good health, that their sleep be long and natural. It is possible, however, that they may sleep too much, and thereby endanger their constitution. In that case, it would be proper to take them out of the cradle, and awaken them by a gentle motion, or by presenting some bright object to their eyes. At this age we receive the first impressions from the senses, which, without doubt, are more important during the rest of life than is generally imagined. Great care ought to be taken to place the cradle in such a manner that the child shall be directly opposite to the light: for the eyes are always directed towards that part of the room where the light is strongest; and, if the cradle be placed sideways, one of them, by turning towards the light, will acquire greater strength than the other, and the child will squint. For the two first months, no other food should be given to the child but the milk of the nurse; and, when it is of a weak and delicate constitution, this nourishment alone should be continued during the third or fourth month. A child, however robust and healthful, may be exposed to great danger and inconvenience, if any other aliment is administered before the end of the first month. In Holland, Italy, Turkey, and the whole Levant, the food of children is limited to the milk of the nurse for a whole year. The savages of Canada give their children suck for four, five, and sometimes even seven years. In this country, as nurses generally have not a sufficient quantity of milk to satisfy the appetite of their children, they commonly supply the want of it by panada, or other light preparations.

The teeth usually begin to appear about the age of seven months. The cutting of these, although a natural operation, does not follow the common laws of nature, which acts continually on the human body without occasioning the smallest pain or even producing any sensation. Here a violent and painful effort is made, accompanied with cries and tears. Children at first lose their sprightliness and gaiety; they become sad, restless, and fretful. The gums are red, and swelled; but they afterwards become white, when

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the pressure of the teeth is so great as to stop the circulation of the blood. Children apply their fingers to their mouth, that they may remove the irritation which they feel there. Some relief is given, by putting into their hands a bit of ivory or of coral, or of some other hard and smooth body, with which they rub the gums at the affected part. This pressure, being opposed to that of the teeth, calms the pain for a moment, contributes to make the membrane of the gum thinner, and facilitates its rupture. Nature here acts in opposition to herself; and an incision of the gum must sometimes take place, to allow a passage to the tooth. For the period of dentition, number of teeth, &c. see ANATOMY, n° 27.

When children are allowed to cry too long and too often, ruptures are sometimes occasioned by the efforts they make. These may easily be cured by the speedy application of bandages; but if this remedy has been too long delayed, the disease may continue through life. Children are very much subject to worms. Some of the bad effects occasioned by these animals might be prevented by giving them a little wine now and then, for fermented liquors have a tendency to prevent their generation.

Though the body is very delicate in the state of infancy, it is then less sensible of cold than at any other part of life. The internal heat appears to be greater: the pulse in children is much quicker than in adults; from which we are certainly intitled to infer, that the internal heat is greater in the same proportion. For the same reason, it is evident that small animals have more heat than large ones; for the beating of the heart and of the arteries is always quicker in proportion to the smallness of the animal. The strokes of the heart in a sparrow succeed one another so rapidly that they can scarcely be counted.

Till three years of age, the life of a child is very precarious. In the two or three following years, it becomes more certain; and at six or seven years of age, a child has a better chance of living than at any other period of life. From the bills of mortality published at London, it appears, that of a certain number of children born at the same time, one half of them die the three first years: according to which, one half of the human race are cut off before they are three years of age. But the mortality among children is not nearly so great every where as in London. *M. Dupre de Saint-Maur*, from a great number of observations made in France, has shown that half of the children born at the same time are not extinct till seven or eight years have elapsed.

Among the causes which have occasioned so great a mortality among children, and even among adults, the small-pox may be ranked as the chief. But luckily the means of alleviating by inoculation the fatal effects of this terrible scourge are now universally known. See INOCULATION, and MEDICINE-Index.

Children begin learning to speak about the age of twelve or fifteen months. In all languages, and among every people, the first syllables they utter are *ba, ba, ma, ma, pa, pa, taba, abada*: nor ought this to excite any surprise, when we consider that these syllables are the sounds most natural to man, because they consist of that vowel, and those consonants, the pronunciation of which require the smallest exertion in the organs of speech. Some children at two years of age articulate

Man.

11
The great
mortality
to which
children
are subject.

12
Speech,
when it
commen-
ces.

Man. articulate distinctly, and repeat whatever is said to them; but most children do not speak till the age of two years and a half, or three years, and often later.

The life of man and of other animals is measured only from the moment of birth: they enjoy existence, however, previous to that period, and begin to live in the state of a foetus. This state is described and explained under the article ANATOMY, n° 110. The period of infancy, which extends from the moment of birth to about twelve years of age, has just now been considered.

13
Period of
puberty and
adolescence.

The period of infancy is followed by that of adolescence. This begins, together with puberty, at the age of twelve or fourteen, and commonly ends in girls at fifteen, and in boys at eighteen, but sometimes not till twenty-one, twenty-three, and twenty-five years of age. According to its etymology (being derived from the Latin word *adolescencia*), it is completed when the body has attained its full height. Thus, puberty accompanies adolescence, and precedes youth. This is the spring of life; this is the season of pleasures, of loves, and of graces: but alas! this smiling season is of short duration. Hitherto nature seems to have had nothing in view but the preservation and increase of her work: she has made no provision for the infant except what is necessary to its life and growth. It has lived, or rather enjoyed a kind of vegetable existence, which was shut up within itself, and which it was incapable of communicating. In this first stage of life, reason is still asleep: but the principles of life soon multiply, and man has not only what is necessary to his own existence, but what enables him to give existence to others. This redundancy of life, this source of health and vigour, can no longer be confined, but endeavours to diffuse and expand itself.

14
Symptoms
of puberty.

The age of puberty is announced by several marks. The first symptom is a kind of numbness and stiffness in the groins, accompanied with a new and peculiar sensation in those parts which distinguish the sexes. There, as well as in the arm-pits, small protuberances of a whitish colour appear, which are the germs of a new production of a kind of hair, by which these parts are afterwards to be veiled. The voice, for a considerable time, is rough and unequal; after which it becomes fuller, stronger, and graver, than it was before. This change may easily be distinguished in boys; but less so in girls, because their voices are naturally sharper. These marks of puberty are common to both sexes: but there are marks peculiar to each, such as the discharge of the menses, and the growth of the breasts, in girls; the beard, and the emission of semen, in boys; in short, the feeling of venereal desire, and the appetite which unites the sexes. Among all races of mankind, the females arrive at puberty sooner than the males; but the age of puberty is different in different nations, and seems partly to depend on the temperature of the climate and the quality of the food. In all the southern countries of Europe, and in cities, the greatest part of girls arrive at puberty about twelve, and boys about fourteen years of age. But in the northern parts, and in the country, girls scarcely arrive at puberty till they are fourteen or fifteen, and boys not till they are sixteen or seventeen. In our climate, girls, for the greatest part, have attained complete maturity at eighteen, and boys at twenty years of age.

At the age of adolescence, and of puberty, the body commonly attains its full height. About that time, young people shoot out several inches almost at once. But there is no part of the human body which increases more quickly and more perceptibly than the organs of generation in both sexes. In males, this growth is nothing but an unfolding of the parts, an augmentation in size; but in females, it often occasions a shrinking and contraction, which have received different names from those who have treated of the signs of virginity. See VIRGINITY.

Marriage is a state suitable to man, wherein he must make use of those new faculties which he has acquired by puberty. At this period of life, the desire of producing a being like himself is strongly felt. The external form and the correspondence of the organs of sex, occasion without doubt that irresistible attraction which unites the sexes and perpetuates the race. By connecting pleasure with the propagation of the species, nature has provided most effectually for the continuance of her work. *Increase and multiply*, is the express command of the Creator, and one of the natural functions of life. We may add, that at the age of puberty a thousand impressions act upon the nervous system, and reduce man to such a situation that he feels his existence only in that voluptuous sense, which then appears to become the seat of his soul, which engrosses the whole sensibility of which he is susceptible, and which at length proceeds to such a height, that its attacks cannot long be supported without a general derangement of the whole machine. The continuance of such a feeling may sometimes indeed prove fatal to those who indulge in excessive enjoyment; but it is equally dangerous to those who obstinately persist in celibacy, especially when strongly solicited by nature. The semen, being too long confined in the seminal vessels, may, by its stimulant property, occasion diseases in both sexes, and excite irritations so violent as to reduce man to a level with the brutes, which, when acted upon by such impressions, are perfectly furious and ungovernable. When this irritation proceeds to extremity, it produces what is called the *furor uterinus* in women. The opposite habit, however, is infinitely more common, especially in the temperate, and above all in the frozen zones. After all, excess is much more to be dreaded than continency. The number of dissolute and intemperate men afford us plenty of examples. Some have lost their memory, some have been deprived of sight, some have become bald, and some have died through mere weakness. In such a case, bleeding is well known to be fatal. Young men cannot be too often warned of the irreparable injury they may do to their health; and parents, to whose care they are entrusted, ought to employ all the means in their power to turn them from such dangerous excesses. But at the age of puberty, young men know not of how great importance it is to prolong this smiling season of their days, whereon the happiness or misery of their future life so much depends. Then they look not forwards to futurity, nor reflect on what is past, nor enjoy present pleasures with moderation. How many cease to be men, or at least to have the faculties of men, before the age of thirty? Nature must not be forced: like a true mother, her object is the sober and discreet union of the sexes. It is sufficient to obey when she commands, and to answer when she calls. Neither must

Man.

15
Effects of
puberty.

16
Its too frequent
abuse.

17
Great importance
of this season
of life.

we

Man. we forget here to mention and condemn an outrage committed against nature, the shameful practice of which endangers the loss of health, and the total ruin of the constitution; we mean that solitary libertinism (*masturbatio*), by which a man or woman, deceiving nature as it were, endeavours to procure those enjoyments which religion has forbidden except when connected with the happiness of being a parent. Such then is the physical order which the Author of nature, the great preserver of the species as well as of the individual, has appointed to induce man, by the attraction of pleasure, to propagate and continue his race.

The procreation of children is the object of marriage; but sometimes this object fails to be accomplished. See IMPOTENCE and STERILITY.

18
Of procreation.

According to the ordinary course of nature, women are not fit for conception till after the first appearance of the menses. When these stop, which generally happens about forty or fifty years of age, they are barren ever after. Their breasts then shrink and decay, and the voice becomes feebler. Some, however, have become mothers before they have experienced any menstrual discharge; and others have conceived at the age of sixty, and sometimes at a more advanced age. Such examples, though not unfrequent, must be considered as exceptions to the general rule; but they are sufficient to show that the menstrual discharge is not essential to generation. The age at which man acquires the faculty of procreating is not so distinctly marked. In order to the production of semen, the body must have attained a certain growth, which generally happens between twelve and eighteen years of age. At sixty or seventy, when the body begins to be enervated by old age, the voice becomes weaker, the semen is secreted in smaller quantities, and it is often unprolific. There are instances, however, of old men who have procreated at the age of eighty or ninety. Boys have been found who had the faculty of generating at nine, ten, or eleven years of age; and young girls who have become pregnant at the age of seven, eight, or nine. But such facts, which are very rare, ought to be considered as extraordinary phenomena in the course of nature.

19
Pregnancy.

Pregnancy is the time during which a woman carries in her womb the fruit of conception. It begins from the moment the prolific faculty has been reduced into act, and all the conditions requisite in both sexes have concurred to form the rudiments of a male or female foetus; and it ends with delivery. As soon as a woman is declared pregnant, says the author of the essay *Sur la maniere de perfectionner l'espece humaine*, she ought to direct her attention wholly to herself, and make the wants of her offspring the standard of her actions. She is now become the depositary of a new creature similar to herself, and differing only in the proportion and successive unfolding of its parts. She must be highly careful not to lace herself tight, to avoid excessive stretchings, and, in short, to disturb in no respect the natural state of the womb. She must likewise beware of indulging certain passions, for we shall afterwards see what great changes are produced in the animal œconomy by strong and violent passions.

An explanation, then, of what takes place during

pregnancy, is nothing but a history of the formation of the foetus; of its expansion; of the extraordinary manner in which it lives, is nourished, and grows in its mother's womb; and of the way in which all these operations are performed with regard to both: for which see ANATOMY, n^o 109, 110. It has been proved by many observations, that the foetus changes its position in the womb, according to the different attitudes of the mother. It is commonly situated with its feet downwards, the breech resting upon the heels, the head bent towards the knees, the hands bent towards the mouth, the feet turned inwards; and in this position it swims like a kind of vessel in the watery fluid contained in the membranes by which it is surrounded, without occasioning any inconvenience to the mother, except what arises from its motions, sometimes to the one side, and sometimes to the other. At times, it even kicks with such violence as to frighten the mother. But when once the head becomes sufficiently large to destroy the equilibrium, it tumbles over and falls downwards; the face is turned towards the *os sacrum*, and the crown of the head towards the orifice of the *uterus*. This happens six weeks or two months before delivery. When the time of delivery arrives, the foetus, finding itself too much confined in the womb, makes an effort to escape with its head first. At length, at the moment of delivery, it unites its own strength with that of the mother, and opens the orifice of the *uterus* wide enough to allow a passage for itself. It happens sometimes that the foetus escapes from the *uterus* without bursting its covering, as is the case with animals. But, in general, the human foetus pierces the membranes by its efforts; and sometimes a very thin part of them remains upon the head like a cap. The ancients considered this membranous covering as a sign of good fortune; and the same idea is still prevalent among the vulgar. The liquor which escapes during delivery is called the *waters* of the mother. These waters serve to guard the foetus from external injuries, by eluding the violence of the blows which the mother may receive upon the belly; and, in the same manner, they defend the womb from the shocks occasioned by the motions of the foetus. In short, by rendering the passages soft and pliable, they facilitate the escape of the child in the time of delivery. (See MIDWIFERY.)—In the womb, the foetus does not respire, as has been already mentioned; consequently what has been said of the cries of children in the womb, must be considered as altogether fabulous.—Women have generally only one child at a birth. When they bear two, three, or more, the foetuses are seldom found under the same covering; and their placentæ, though adhering, are almost always distinct. Twins are not uncommon, but there are seldom more. It is supposed, that among women with child, there is only one in 2500 who brings forth three children at a birth, one in 20,000 who brings forth four, and one in a million who brings forth five. When the number amounts to five, or even when there are but three or four, they are generally of a weakly constitution; most of them die in the womb, or soon after delivery. See the article PROLIFIC.

At the age of puberty, or a few years after, the body attains its full stature. Some young men grow

Man.

20
Parturition.

Man. no taller after 15 or 16, and others continue to grow till the age of 20 or 23. At this period they are very slender: but by degrees the members swell and begin to assume their proper shape; and before the age of 30, the body in men has attained its greatest perfection with regard to strength, consistence, and symmetry. Adolescence ends at the age of 20 or 25; and at this period youth (according to the division which has been made of the years of man's life into different ages) begins. It continues till the age of 30 or 35.

21
Period of youth.

22
Stature of man.

The common stature of men is about five feet and three, four, five, six, or seven inches; and of women about five feet and two, three, or four inches. Men below five feet are of a small stature. The Laplanders do not exceed four feet and a half; and the natives of some other countries are still smaller. Women attain their full height sooner than men. Haller computes, that in the temperate climates of Europe, the medium stature of men is about five feet and five or six inches. It is observed by the same author, that in Switzerland the inhabitants of the plains are taller than those of the mountains. It is difficult to ascertain with precision the actual limits of the human stature. In surveying the inhabited earth, we find greater differences in the statures of individuals than in those of nations. In the same climate, among the same people, and sometimes in the same family, there are men whose stature is either too tall or too diminutive. See the articles GIANT and DWARF.

23
State of manhood.

The body having acquired its full height during the period of adolescence, and its full dimensions in youth, remains for some years in the same state before it begins to decay. This is the period of manhood, which extends from the age of 30 or 35 to that of 40 or 45 years. During this stage, the powers of the body continue in full vigour, and the principal change which takes place in the human figure arises from the formation of fat in different parts. Excessive fatness disfigures the body, and becomes a very cumbersome and inconvenient load.

24
Nobleness of the human form and movements.

The body of a well-shaped man ought to be square, the muscles ought to be strongly marked, the contour of the members boldly delineated, and the features of the face well defined. In women, all the parts are more rounded and softer, the features are more delicate, and the complexion brighter. To man belong strength and majesty; gracefulness and beauty are the portion of the other sex. The structure essential to each will be found in the description of the human skeleton, under the article ANATOMY.

Every thing in both sexes points them out as the sovereigns of the earth; even the external appearance of man declares his superiority to other living creatures. His body is erect; his attitude is that of command; his august countenance, which is turned towards heaven, bears the impressions of his dignity. The image of his soul is painted in his face; the excellence of his nature pierces through the material organs, and gives a fire and animation to the features of his countenance. His majestic deportment, his firm and emboldened gait, announce the nobleness of his rank. He touches the earth only with his extremity: he views it only at a distance, and seems to despise it. It has been justly observed, that the countenance

of man is the mirror of his mind. In the looks of no animal are the expressions of passion painted with such energy and rapidity, and with such gentle gradations and shades, as in those of man. We know, that in certain emotions of the mind, the blood rises to the face, and produces blushing; and that in others, the countenance turns pale. These two symptoms, the appearance of which depends on the structure and the transparency of the reticulum, especially redness, constitute a peculiar beauty. In our climates, the natural colour of the face of a man in good health is white, with a lively red suffused upon the cheeks. Paleness of the countenance is always a suspicious symptom. That colour which is shaded with black is a sign of melancholy and of vitiated bile; and constant and universal redness is a proof that the blood is carried with too great impetuosity to the brain. A livid colour is a morbid and dangerous symptom; and that which has a tint of yellow is a sign of jaundice or repletion of bile. The colour of the skin is frequently altered by want of sleep or of nourishment, or by looseness and diarrhoea.

Notwithstanding the general similitude of countenance in nations and families, there is a wonderful diversity of features. No one, however, is at a loss to recollect the person to whom he intends to speak, provided he has once fully seen him. One man has liveliness and gaiety painted in his countenance, and announces before-hand, by the cheerfulness of his appearance, the character which he is to support in society. The tears which bedew the cheeks of another man would excite compassion in the most unfeeling heart. Thus the face of man is the rendezvous of the symptoms both of his moral and physical affections: tranquillity, anger, threatening, joy, smiles, laughter, malice, love, envy, jealousy, pride, contempt, disdain or indignation, irony, arrogance, tears, terror, astonishment, horror, fear, shame or humiliation, sorrow and affliction, compassion, meditation, particular convulsions, sleep, death, &c. &c. The difference of these characters appears to us of sufficient importance to form a principal article in the natural history of man.

25
Diversity of the countenance.

When the mind is at ease, all the features of the face are in a state of profound tranquillity. Their proportion, harmony, and union, point out the serenity of the thoughts. But when the soul is agitated, the human face becomes a living canvas, whereon the passions are represented with equal delicacy and energy, where every emotion of the soul is expressed by some feature, and every action by some mark; the lively impression of which anticipates the will, and reveals by pathetic signs our secret agitation, and those intentions which we are anxious to conceal. It is particularly in the eyes that the soul is painted in the strongest colours and with the most delicate shades.

26
Analysis of the features.

The different colours of the eyes are, dark hazel, light hazel, green, blue, gray, and whitish-gray. The most common of these colours are hazel and blue, both of which are often found in the same eye. Eyes which are commonly called black, are only dark hazel; they appear black in consequence of being contrasted with the white of the eye. Wherever there is a tint of blue, however slight, it becomes the prevailing colour, and outlines

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outshines the hazel, with which it is intermixed, to such a degree, that the mixture cannot be perceived without a very narrow examination. The most beautiful eyes are those which appear black or blue. In the former, there is more expression and vivacity; in the latter, more sweetness and perhaps delicacy.

Next to the eyes, the parts of the face by which the physiognomy is most strongly marked, are the eye-brows. Being of a different nature from the other parts, their effect is increased by contrast. They are like a shade in a picture, which gives relief to the other colours and forms.

The fore-head is one of the largest parts of the face, and contributes most to its beauty. Every body knows of how great importance the hair is in the physiognomy, and that baldness is a very great defect. When old age begins to make its approaches, the hair which first falls off is that which covers the crown of the head and the parts above the temples. We seldom see the hair of the lower part of the temples, or of the back of the head, completely fall off. Baldness is peculiar to men: women do not naturally lose their hair, tho' it becomes white as well as that of the men at the approach of old age.

The nose is the most prominent feature of the face. But as it has very little motion, and that only in the most violent passions, it contributes less to the expression than to the beauty of the countenance. The nose is seldom perpendicular to the middle of the face, but for the most part is turned to one side or the other. The cause of this irregularity, which, according to the painters, is perfectly consistent with beauty, and of which even the want would be a deformity, appears to be frequent pressure on one side of the cartilage of the child's nose against the breast of the mother when it receives suck. At this early period of life, the cartilages and bones have acquired very little solidity, and are easily bent, as may be observed in the legs and thighs of some individuals, who have been injured by the bandages of the swaddling clothes.

Next to the eyes, the mouth and lips have the greatest motion and expression. These motions are under the influence of the passions. The mouth, which is set off by the vermilion of the lips and the enamel of the teeth, marks, by the various forms which it assumes, their different characters. The organ of the voice likewise gives animation to this feature, and communicates to it more life and expression than is possessed by any of the rest. The cheeks are uniform features, and have no motion or expression excepting from that involuntary redness or paleness with which they are covered in different passions, such as shame, anger, pride, and joy, on the one hand; and fear, terror, and sorrow, on the other.

In different passions, the whole head assumes different positions, and is affected with different motions. It hangs forward during shame, humility, and sorrow; it inclines to one side in languor and compassion; it is elevated in pride, erect and fixed in obstinacy and self-conceit: In astonishment it is thrown backwards; and it moves from side to side in contempt, ridicule, anger, and indignation.

In grief, joy, love, shame, and compassion, the eyes swell, and the tears flow. The effusion of tears is

always accompanied with an extension of the muscles of the face, which opens the mouth.

In sorrow, the corners of the mouth are depressed, the under-lip rises, the eye-lids fall down, the pupil of the eye is raised and half concealed by the eye-lid. The other muscles of the face are relaxed, so that the distance between the eyes and the mouth is greater than ordinary; and consequently the countenance appears to be lengthened.

In fear, terror, consternation, and horror, the forehead is wrinkled, the eye-brows are raised, the eye-lids are opened as wide as possible, the upper lid uncovers a part of the white above the pupil, which is depressed and partly concealed by the under lip. At the same time, the mouth opens wide, the lips recede from each other, and discover the teeth both above and below.

In contempt and derision, the upper lip is raised at one side and exposes the teeth, while the other side of the lip moves a little and wears the appearance of a smile. The nostril on the elevated side of the lip shrivels up, and the corner of the mouth falls down. The eye on the same side is almost shut, while the other is open as usual; but the pupils of both are depressed, as when one looks down from a height.

In jealousy, envy, and malice, the eye-brows fall down and are wrinkled; the eye-lids are elevated, and the pupils are depressed. The upper lip is elevated on both sides, while the corners of the mouth are a little depressed, and the under lip rises to join the middle of the upper.

In laughter, the corners of the mouth are drawn back and a little elevated; the upper parts of the cheeks rise; the eyes are more or less closed; the upper lip rises, and the under one falls down; the mouth opens; and in cases of immoderate laughter, the skin of the nose wrinkles. That gentler and more gracious kind of laughter which is called *smiling*, is seated wholly in the parts of the mouth. The under lip rises; the angles of the mouth are drawn back; the cheeks are puffed up; the eye-lids approach one another; and a small twinkling is observed in the eyes. It is very extraordinary, that laughter may be excited either by a moral cause without the immediate action of external objects, or by a particular irritation of the nerves without any feeling of joy. Thus an involuntary laugh is excited by a slight tickling of the lips, of the palm of the hand, of the sole of the foot, of the arm-pits, and, in short, below the middle of the ribs. We laugh when two dissimilar ideas, the union of which was unexpected, are presented to the mind at the same time, and when one or both of these ideas, or their union, includes some absurdity which excites an emotion of disdain mingled with joy. In general, striking contrasts never fail to produce laughter.

A change is produced in the features of the countenance by weeping as well as by laughing. When we weep, the under lip is separated from the teeth, the forehead is wrinkled, the eye-brows are depressed: the dimple, which gives a gracefulness to laughter, forsakes the cheek: the eyes are more compressed, and almost constantly bathed in tears, which in laughter flow more seldom and less copiously.

The

Man.

27
The motions produced in them by the passions.

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The arms, hands, and every part of the body, contribute to the expression of the passions. In joy, for instance, all the members of the body are agitated with quick and various motions. In languor and sorrow, the arms hang down, and the whole body remains fixed and immoveable. In admiration and surprise, this total suspension of motion is likewise observed. In love, desire, and hope, the head and eyes are raised to heaven, and seem to solicit the wished-for good; the body leans forward as if to approach it; the arms are stretched out, and seem to seize before-hand the beloved object. On the contrary, in fear, hatred, and horror, the arms seem to push backward and repel the object of our aversion; we turn away our head and eyes as if to avoid the sight of it; we recoil in order to shun it.

28
Vigour,
&c. of the
human
body.

Although the human body is externally much more delicate than that of any other animal, yet it is very nervous, and perhaps stronger in proportion to its size than that of the strongest animals. We are assured that the porters at Constantinople carry burdens of 900 pounds weight. A thousand wonderful stories are related of the Hottentots and other savages concerning their agility in running. Civilized man knows not the full extent of his powers, nor how much he loses by that effeminacy and inactivity by which they are weakened and destroyed. He is contented even to be ignorant of the strength and vigour which his members are capable of acquiring by motion, and by being accustomed to severe exercises, as is observed in runners, tumblers, and rope-dancers. The conclusion is, therefore, founded on the most just and indisputable induction and analogy.—The attitude of walking is less fatiguing to man than that in which he is placed when he is stopped in running. Every time he sets his foot upon the ground, he passes over a more considerable space; the body leans forwards, and the arms follow the same direction; the respiration increases, and breathing becomes difficult. Leaping begins with great inflexions of the members; the body is then much shortened, but immediately stretches itself out with a great effort. The motions which accompany leaping make it very fatiguing.

29
Restoration
of its pow-
ers by sleep

It is observed by M. Daubenton (*Nouvelle Encyclopédie*), that a cessation from exercise is not alone sufficient to restore the powers of the body when they are exhausted by fatigue. The springs, though not in action, are still wound up while we are awake, even when every movement is suspended. In sleep nature finds that repose which is suited to her wants, and the different organs enjoy a salutary relaxation. This is that wonderful state in which man, unconscious of his own existence, and sunk in apparent death, repairs the loss which his faculties has sustained, and seems to assume a new existence. In this state of drowsiness and repose, the senses cease to act, the functions of the soul are suspended, and the body seems abandoned to itself. The external symptoms of sleep, which alone are the object of our attention, are easily distinguished. At the approach of sleep, the eyes begin to wink, the eye-lids fall down, the head nods and hangs down: its fall astonishes the sleeper; he starts up, and makes an effort to drive away sleep, but in vain; a new inclination, stronger than the former, deprives him of the power of raising his head; his chin rests upon

his breast, and in this position he enjoys a tranquil sleep. See the article SLEEP.

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Physiologists give the name of old age to that period of life which commences immediately after the age of manhood and ends at death; and they distinguish green old age from the age of decrepitude. But in our opinion, such an extensive signification of the word ought not to be admitted. We are not old men at the age of forty or forty-five; and though the body then gives signs of decay, it has not yet arrived at the period of old age. M. Daubenton observes, that it would be more proper to call it the *declining age*, because nature then becomes retrograde, the fatness and good plight of the body diminishes, and certain parts of it do not perform their functions with equal vigour.

The age of decline extends from forty or forty-five to sixty or sixty-five years of age. At this time of life, the diminution of the fat is the cause of those wrinkles which begin to appear in the face and some other parts of the body. The skin, not being supported by the same quantity of fat, and being incapable, from want of elasticity, of contracting, sinks down and forms folds. In the decline of life, a remarkable change takes place also in vision. In the vigour of our days, the crystalline lens, being thicker and more diaphanous than the humours of the eye, enables us to read letters of a very small character at the distance of eight or ten inches. But when the age of decline comes on, the quantity of the humours of the eye diminishes, they lose their clearness, and the transparent cornea becomes less convex. To remedy this inconvenience, we place what we wish to read at a greater distance from the eye: but vision is thereby very little improved, because the image of the object becomes smaller and more obscure. Another mark of the decline of life is a weakness of the stomach, and indigestion, in most people who do not take sufficient exercise in proportion to the quantity and the quality of their food.

At sixty, sixty-three, or sixty-five years of age, the signs of decline become more and more visible, and indicate *old age*. This period commonly extends to the age of seventy, sometimes to seventy-five, but seldom to eighty. When the body is extenuated and bent by old age, man then becomes crazy. Crazynefs therefore is nothing but an *infirm old age*. The eyes and stomach then become weaker and weaker; leanness increases the number of the wrinkles; the beard and the hair become white; the strength and the memory begin to fail.

31
Old age.

After seventy, or at most eighty years of age, the life of man is nothing but labour and sorrow: Such was the language of David near three thousand years ago. Some men of strong constitutions, and in good health, enjoy old age for a long time without decrepitude; but such instances are not very common. The infirmities of decrepitude continually increase, and at length death concludes the whole. This fatal term is uncertain. The only conclusions which we can form concerning the duration of life, must be derived from observations made on a great number of men who were born at the same time, and who died at different ages. These we shall mention in the sequel.

The signs of decrepitude form a striking picture of weakness, and announce the approaching dissolution of

Man.
32
Decrepitude, and death.

of the body. The memory totally fails; the nerves become hard and blunted; deafness and blindness take place; the senses of smell, of touch, and of taste, are destroyed; the appetite fails; the necessity of eating, and more frequently that of drinking, are alone felt; after the teeth fall out, mastication is imperfectly performed, and digestion is very bad; the lips fall inwards; the edges of the jaws can no longer approach one another; the muscles of the lower jaw become so weak, that they are unable to raise and support it: the body sinks down; the spine is bent outward; and the vertebræ grow together at the anterior part: the body becomes extremely lean; the strength fails: the decrepid wretch is unable to support himself; he is obliged to remain on a seat, or stretched in his bed: the bladder becomes paralytic; the intestines lose their spring; the circulation of the blood becomes slower; the strokes of the pulse no longer amount to the number of eighty in a minute as in the vigour of life, but are reduced to twenty-four and sometimes fewer: respiration is slower; the body loses its heat; the circulation of the blood ceases; death follows; and the dream of life is no more.

33
Man naturally formed for long life.

Man, says Haller in his Physiology, has no right to complain of the shortness of life. Throughout the whole of living beings, there are few who unite in a greater degree all the internal causes which tend to prolong its different periods. The term of gestation is very considerable; the rudiments of the teeth are very late in unfolding; his growth is slow, and is not completed before about twenty years have elapsed.—The age of puberty, also, is much later in man than in any other animal. In short, the parts of his body being composed of a softer and more flexible

substance, are not so soon hardened as those of inferior animals. Man, therefore, seems to receive at his birth the seeds of a long life: if he reaches not the distant period which nature seemed to promise him, it must be owing to accidental causes foreign to himself. Instead of saying that he has finished his life, we ought rather to say that he has not completed it.

The natural and total duration of life is in some measure proportioned to the period of growth. A tree or an animal which soon acquires its full size, decays much sooner than another which continues to grow for a longer time. If it is true that the life of animals is eight times longer than the period of their growth, we might conclude that the boundaries of human life may be extended to a century and a half.

It does not appear that the life of man becomes shorter in proportion to the length of time the world has existed. In the days of the Psalmist, the ordinary limits of human life did not exceed seventy or eighty years. No king of Judah lived beyond that period. When the Romans, however, were numbered by Vespasian, there were found in the empire, in that age of effeminacy, ten men aged an hundred and twenty and upwards. Among the princes of modern times, the late Frederick the Great of Prussia lived to the age of 74. George II. of Britain lived to that of 77. Louis XIV. lived to the same age. Stanislaus king of Poland and duke of Lorraine exceeded that age. Pope Clement XII. lived to the age of 80. George I. of Britain attained the age of 83. M. Bomare has collected divers instances of persons who lived to the age of 110 and upwards, of which we shall in a note (D) specify a few in supplement to those already given under the article LONGEVITY.

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34

Duration of life.

Before

(D) William Lecomte, a shepherd, died suddenly in 1776, in the county of Caux in Normandy, at the age of 110. Cramers, physician to the emperor, saw at Temeswar two brothers, the one aged 110 and the other 112, both of whom were fathers at that age. Saint Paul the hermit was 113 at his death. The Sieur Iswan-Horwaths, knight of the order of St Louis, died at Sar-Albe in Lorraine in 1775, aged almost 111. He was a great hunter. He undertook a long journey a short time before his death, and performed it on horseback. Rosine Iwiwarouska died at Minsk in Lithuania at the age of 113. Fockjel Johannes died at Oldeborn in Friesland, aged 113 years and 16 days. Marik Jonas died in the year 1775 at Vilejac in Hungary, aged 119. John Niethen of Bakler in Zeland lived to the age of 120. Eleonora Spicer died in 1773, at Accomack in Virginia, aged 121. John Argus was born in the village of Lastua in Turkey, and died the 6th of March 1779, at the age of 123; having six sons and three daughters, by whom he had posterity to the fifth generation. They amounted to the number of 160 souls, and all lived in the same village. His father died at the age of 120. In December 1777, there lived in Devonshire a farmer named John Brookey, who was 134 years of age, and had been fifteen times married. The Philosophical Transactions mention an Englishman of the name of Eccleston, who lived to the age of 143. Another Englishman of the name of Effingham, died in 1757 at the age of 144. Niels Jukens of Hamerfet in Denmark died in 1764, aged 146. Christian Jacob Drakemberg died in 1770 at Archusen, in the 146th year of his age. This old man of the north was born at Stavanger in Norway in 1624, and at the age of 130 married a widow of 60. In Norway some men have lived to the age of 150. John Rovin, who was born at Szatlova-Carantz-Betcher, in the bannat of Temeswar, lived to the age of 172, and his wife to that of 164, having been married to him during the space of 147 years. When Rovin died, their youngest son was 99 years of age. In the *Gazette de France*, Jan. 18. 1780, we are informed that there lived at that time at Cordova du Tucuman, in Spanish America, a negro woman called Louisa Trexo, who, by the judicial testimony of several persons 100 years old, and of a negro woman of 120, was aged between 174 and 175 years. Peter Zoten, a peasant, and a countryman of John Rovin, died in 1724 at the age of 185. His youngest son was then 97 years of age. The history and whole length pictures of John Rovin, Henry Jenkins, and Peter Zorten, are to be seen in the library of S. A. R. prince Charles at Brussels. Hanovius, professor at Dantzick, mentions in his nomenclature an old man who died at the age of 184; and another still alive in Wallachia, whose age, according to this author, amounts to 186. *Dictionnaire d'Hist. Nat. voce HOMME.*

35
Remarks on instances of longevity.

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36
Chief cau-
ses of lon-
gevity.

Before we proceed to assign the common causes of longevity, it is proper to inquire into the manner of life and the situation of those by whom it has been enjoyed. We find, then, that those who have lived to the greatest age have been such as did not attain their full growth till a very advanced period of life, and who have kept their appetites and passions under the most complete subjection. In a word, those who have exceeded 100 years, have in general been robust, laborious, sober, and careful to observe the strictest regimen. Enjoying a good constitution from nature, they have seldom or never been subject to disease. They have even enjoyed the greatest health and vigour, and retained the use of their senses to the last moment of their lives.

Among those who have led a life of contemplation and study, many have reached a very advanced age. Longevity is frequent among the different orders of religious, who by their statutes are confined to a moderate diet, and obliged to abstain from wine and the use of meat. Some celebrated anchorites have lived to a great age while they fed upon nothing but the wild roots and fruits which they found in the desert whither they had retired. The philosopher Xenophilus, who lived to the age of 106, was of the Pythagorean sect. It is well known, that those philosophers who held the transmigration of souls, denied themselves the use of meat, because they imagined that killing an animal would be to assassinate another self. A country life has produced many sound and vigorous old men. It is supposed that a happy old age is attained with greater difficulty in towns than in the country. Sir Hans Sloane, Duverney, and Fontenelle, however, are instances of men whose lives have been spent in cities, and yet extended to a very great length. It has been observed, that men deprived of reason live very long; and this Dr Haller imputes to their being exempted from those inquietudes which he considers as the most deadly poison. Persons possessing a sufficiently good understanding, but destitute of ambition, have been found to enjoy very long life. Men who are devoid of pretensions, who are free from those cares which a desire of shining by a display of talents, or of acquiring dignity and power, necessarily brings in its train, who feel no regret for the past nor anxiety about the future, are strangers to those torments of the mind which waste and consume the body. To that tranquillity of soul, which is so excellent a prerogative of infancy, they add that of being long young by physical constitution on which the moral has a striking and powerful influence.

Premature wisdom, and early talents, are often fitter to excite astonishment than expectation. The rapid unfolding of the moral faculties, by shortening the period of youth, seems to diminish in proportion the total duration of life. We have known a young lady of seventeen, who could speak very correctly seven languages: she translated and wrote Latin, Greek, Italian, Spanish, German, English, and French; but she died at the age of eighteen. The young man by whom she was asked in marriage, having been informed that he could not obtain her hand till he had made himself worthy of her by the same degree of talents and information, died the same year, and at

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the same age. But in some families, the web of life, to use an expression of Haller, seems to be better warped than in others: of this kind were the families of *Thomas Parr*, mentioned under LONGEVITY; and *John Argus*, mentioned in the foregoing note.

From the preceding observations, Dr Haller has attempted to deduce the causes why a few men are longer exempted than others from the common fate.

The circumstances which oppose their influence are independent of our will; such as the ravages of epidemic distempers, trouble, and anxiety of mind, which create diseases in the body, or the torments of ambition. It is necessary to live in a salubrious climate, to enjoy a fortune sufficiently easy to exclude those uneasy desires which create a feeling of want and privation, to be descended from healthy parents, to avoid drinking wine in youth, to drink water, and to eat little meat and a great deal of vegetables. It is necessary also to be temperate in meals; moderate in pleasures, study, and exercise; to be naturally inclined to cheerfulness; and to allot a due time to sleep and repose.

Long life is certainly very rare; but, as has been already observed, we must distinguish between what is natural to the constitution of man, and that which is the consequence of his condition. By the former he is made to be long lived; but nature is arrested in her course by local and accidental causes, which it is not in our power to avoid.

Let us take a retrospective view of man's life from his infancy, and enumerate the chief of these different causes. Of a thousand infants, an account of which Dr Haller has extracted from the London bills of mortality, twenty-three died almost as soon as they came into the world: teething carried off fifty, and convulsions two hundred and seventy-seven: eighty died of the small pox, and seven of the measles. Among the adult females, eight at least died in child-bed: consumption and asthma, diseases more frequent in England than in France, carried off an hundred and ninety-one of the same sex, and almost a fifth part of the full grown men. An hundred and fifty died of fevers. At a more advanced age, twelve died of apoplexy, and forty-one of dropsy, without mentioning those to whom diseases of little importance in themselves became mortal. There only remained seventy-eight whose death could be ascribed to old age; and of these twenty-seven lived to the age of eighty and upwards. Among the different diseases of which we have just now seen the fatal effects, and which carry off more than nine-tenths of mankind, not one, it must be allowed, is natural to the constitution. The inhabitants of this island are in general but little subject to diseases, excepting the small-pox and the measles; and many of them enjoy uninterrupted health to old age.

What are the most prevalent diseases in other countries, which prove equally fatal to the duration of human life? In northern climates, scurvy, the colic of the Laplanders, and diseases of the lungs, most frequently occasion death. In temperate climates, dropsy carries off a great many at the beginning of old age, which is the boundary of life in the greatest part of both sexes, when they have escaped the acute diseases, such as putrid fever, &c. Acute diseases are most common in warm countries. In some places, the rays

Man. of the sun kill in a few hours those who are exposed to its burning heat. The air of Egypt and of Asia Minor engenders the plague, by which one half of their inhabitants are carried off. Between the tropics men are subject to dysenteries and violent fevers. The cold of the night, in warm climates, occasions sometimes violent diseases, such as palsy, quinsy, and a swelling of the head. Damp and marshy places give rise to fevers of a different kind, but also very dangerous. The life of sailors has a great tendency to produce scurvy. How many professions prove fatal to the health, and in most men hasten that period which nature would have brought on by slow degrees! Miners; stone-cutters, gilders, persons employed in emptying privies, &c. are subject to diseases of the lungs, and become paralytic. Other professions of life bring on other accidents, of which it would carry us too far to give a particular account. What has been said is sufficient to show, that it is the dangers with which we are surrounded that shorten the period of human life.

By examining the list of those who have attained a great age, it will be found that mankind are longer lived in northern than in southern countries. It has been observed, that there are more old men in mountains and elevated situations than in plains and low countries. We repeat it, if the duration of life among the inhabitants of southern climates be compared with the duration of life in northern nations, it will be allowed, that the latter enjoy both longer life and better health than the former. Their growth being retarded by the rigour of the climate, their decay must also be slower, because of the proportion which exists between the growth of animals and the length of their lives. Among ten persons who have lived to the age of an hundred, eight or nine will be found to have lived in the north.

38
More women than men attain to old age

It appears from the bills of mortality, that in the country more boys are born than girls: in cities, on the contrary, the number of females is commonly greatest. Observations made with great care prove, that in most countries there are fewer men alive than women, and that more males die, chiefly at the first and last periods of life. In Sweden, the whole number of females in 1763, was to that of males in the proportion of ten to nine. The number of old women who exceeded 80 years of age, was to that of old men of the same age in the proportion of 33 to 19: and there were more women than men who had attained the age of 86, in the proportion of almost two to one.

39
Villages more favourable than towns to longevity.

The late Dr Price made observations, after Dr Percival, on the difference of longevity, and the duration of human life, in towns, country-parishes, and villages; of which the following is the result. A greater number in proportion die in great towns than in small ones, and a greater number in the latter than in villages. The cause of this difference, which is found to be very great, must be, in the first place, the luxury and dissipation which prevail in towns; and, secondly, the badness of the air. In the town of Manchester, according to observation, $\frac{1}{28}$ of the inhabitants die annually; whereas, in the neighbouring country, the number of deaths does not exceed $\frac{1}{48}$ of the whole inhabitants. It may be laid down as a general principle, that in

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great towns, the number of deaths annually is from 1 in 19 to 1 in 22 or 23; in middling towns, from 1 in 24 to 1 in 28; and in country parishes and villages seldom more than 1 in 40 or 50. In 1763, the number of inhabitants in Stockholm amounted to 72,979. The average number of deaths for the six years preceding had been 3802, which makes 1 in 19 annually; while throughout all Sweden, including the towns and the country, not more than 1 in 35 die annually. At Rome the inhabitants are numbered every year. In 1771 they were found to amount to 159,675: the average number of deaths for ten years was 7367; which makes 1 in 23 $\frac{1}{2}$ annually. In London not less than 1 in 20 $\frac{1}{2}$ of the inhabitants die every year.

M. Daubenton has given in the *Encyclopédie Méthodique*, a table of the probabilities of the duration of life, constructed from that which is to be found in the seventh volume of the *Supplément à l'Histoire Naturelle de M. de Buffon*.

The following is an abridgment of it:

Of 23,994 children born at the same time, there will probably die,

In one year	-	-	-	7998
Remaining $\frac{2}{3}$ or 15996.				
In eight years	-	-	-	11997
Remaining $\frac{1}{3}$ or 11997.				
In 38 years	-	-	-	15996
Remaining $\frac{1}{3}$ or 7998.				
In 50 years	-	-	-	17994
Remaining $\frac{1}{4}$ or 5998.				
In 61 years	-	-	-	19995
Remaining $\frac{1}{8}$ or 3999.				
In 70 years	-	-	-	21595
Remaining $\frac{1}{10}$ or 2399.				
In 80 years	-	-	-	22395
Remaining $\frac{1}{10}$ or 599.				
In 90 years	-	-	-	23914
Remaining $\frac{1}{100}$ or 79.				
In 100 years	-	-	-	23992
Remaining $\frac{1}{10000}$ or 2.				

It thus appears, that a very small number of men indeed pass through all the periods of life, and arrive at the goal marked out by nature. Innumerable causes accelerate our dissolution. The life of man, we have observed, consists in the activity and exercise of his organs, which grow up and acquire strength during infancy, adolescence, and youth. No sooner has the body attained its utmost perfection, than it begins to decline. Its decay is at first imperceptible; but in the progress of time the membranes become cartilaginous, the cartilages acquire the consistence of bone; the bones become more solid, and all the fibres are hardened. Almost all the fat wastes away; the skin becomes withered and scaly; wrinkles are gradually formed; the hair grows white; the teeth fall out; the face loses its shape; the body is bent; and the colour and consistence of the crystalline humour become more perceptible. The first traces of this decay begin to be perceived at the age of forty, and sometimes sooner; this is the *age of decline*. They increase by slow degrees till sixty, which is the *period of old age*. They increase more rapidly till the age of seventy or seventy-five. At this period *craziness* begins, and continues always to increase. Next succeeds *decrepitude*,

3 U

when

Man.

40
Probabilities of the duration of life.

41
Recapitulation of the different stages.

Man.

when the memory is gone, the use of the senses lost, the strength totally annihilated, the organs worn out, and the functions of the body almost destroyed. Little now remains to be lost; and before the age of ninety or an hundred, death terminates at once decrepitude and life.

42
Gradual
extinction
of life.

The body then dies by little and little: its motion gradually diminishes; life is extinguished by successive gradations, and death is only the last term in the succession. When the motion of the heart, which continues longest, ceases, man has then breathed his last; he has passed from the state of life to the state of death; and as at his birth a breath opened to him the career of life, so with a breath he finishes his course.

43
Natural
cause of
death.

This natural cause of death is common to all animals and even to vegetables. We may observe that the centre of an oak first perishes and falls into dust, because these parts having become harder and more compact can receive no further nourishment. The causes of our dissolution, therefore, are as necessary as death is inevitable; and it is no more in our power to retard this fatal term than to alter the established laws of the universe. Hence the following maxim has been universally adopted, *Contra vim mortis, nullum medicamentum in hortis*. In whatever manner death happens, the time and circumstances thereof are unknown. It is considered, however, as at all times terrible, and the very thoughts of it fill the mind with fear and trouble. It is notwithstanding our duty frequently to direct our thoughts to that event, which must inevitably happen, and by a life of virtue and innocence to prepare against those consequences which we so much dread.

44
Operates
more slowly
upon women
than upon men.

As in women the bones, the cartilages, the muscles, and every other part of the body, are softer and less solid than those of men, they must require more time in hardening to that degree which occasions death.—Women of course ought to live longer than men. This reasoning is confirmed by experience; for by consulting the bills of mortality, it appears, that after women have passed a certain age they live much longer than men who have arrived at the same age.—In like manner, it is found by experience, that in women the age of youth is shorter and happier than in men, but that the period of old age is longer, and attended with more trouble. *Citius pubescunt, citius senescunt*.

45
Dissolution
of the body.

After death, the organization of the body begins to be dissolved, and all the parts relax, corrupt, and separate. This is produced by an intestine fermentation, which occasions putrefaction, and reduces the body to volatile alkali, fetid oil, and earth.

THE other particulars that were proposed to be noticed in this article are, The several senses with which man is endowed; his constitution, and animal functions; and that variety of colour, form, and character, which he assumes in different quarters of the globe. But there is no occasion to enlarge upon those topics here, as they have been already explained in other parts of the work. For the two first, see ANATOMY, *passim*. The last has been partly discussed under the word COMPLEXION, and will be resumed afterwards under the article VARIETIES of the Human Species. For what regards man,

considered as a rational, social, moral, and religious being, see METAPHYSICS, MORAL Philosophy, RELIGION, and THEOLOGY; also SOCIETY, LAW, LANGUAGE, and LOGIC.

Man.

ISLE OF MAN, an island in the Irish sea, lying about seven leagues north from Anglesey, about the same distance west from Lancashire, nearly the like distance south-east from Galloway, and nine leagues east from Ireland. Its form is long and narrow, stretching from the north-east of Ayre-point to the Calf of Man, which lies south-west, at least 30 English miles. Its breadth in some places is more than nine miles, in most places eight, and in some not above five, and contains about 160 square miles.

The first author who mentions this island is Cæsar; for there can be as little doubt, that, by the *Mona*, of which he speaks in his Commentaries, placing it in the midst between Britain and Ireland, we are to understand Man; as that the *Mona* of Tacitus, which he acquaints us had a fordable strait between it and the continent, can be applied only to Anglesey. Pliny has set down both islands; *Mono*, by which he intends Anglesey, and *Menabia*, which is Man. In Ptolemy we find *Monaæda*, or *Monaida*, that is, the farther or more remote Mön. Orosius styles it *Menavia*; tells us, that it was not extremely fertile; and that this, as well as Ireland, was then possessed by the Scots. Bede, who distinguishes clearly two Menavian islands, names this the northern *Menavia*, bestowing the epithet of southern upon Anglesey. In some copies of Nennius, this isle is denominated *Eubonia*; in others, *Menavia*; but both are explained to mean *Man*. Alured of Beverley also speaks of it as one of the Menavian islands. The Britons, in their own language, called it *Manaw*, more properly *Main au*, i. e. "a little island," which seems to be latinized in the word *Menavia*. All which clearly proves, that this small isle was early inhabited, and as well known to the rest of the world as either Britain or Ireland.

In the close of the first century, the Druids, who were the priests, prophets, and philosophers of the old Britons, were finally expelled by Julius Agricola from the southern *Mona*; and we are told, that they then took shelter in the northern. This island they found well planted with firs; so that they had, in some measure, what they delighted in most, the shelter of trees; but, however, not the shelter of those trees in which they most delighted, viz. the oaks: and therefore these they introduced. No histories tell us this; but we learn it from more certain authority, great woods of fir having been discovered interred in the bowels of the earth, and here and there small groves of oaks: but as these trees are never met with intermixed, so it is plain they never grew together; and as the former are by far the most numerous, we may presume them the natural produce of the country, and that the latter were planted and preserved by the Druids. They gave the people, with whom they lived, and over whom they ruled, a gentle government, wise laws, but withal a very superstitious religion. It is also very likely that they hindered them, as much as they could, from having any correspondence with their neighbours; which is the reason

that

Man. that, though the island is mentioned by so many writers, not one of them, before Orosius, says a word about the inhabitants. A little before his time, that is, in the beginning of the fifth century, the Scots had transported themselves thither, it is said, from Ireland. The tradition of the natives of Man (for they have a traditionary history) begins at this period. They style this first discoverer *Mannan Mac Lear*; and they say that he was a magician, who kept this country covered with mists, so that the inhabitants of other places could never find it. But the ancient chronicles of Ireland inform us, that the true name of this adventurer was *Orbsenius*, the son of Alladius, a prince in their island; and that he was surnamed *Mannanan*, from his having first entered the island of Man, and *Mac Lir*, i. e. "the offspring of the sea," from his great skill in navigation. He promoted commerce; and is said to have given a good reception to St Patrick, by whom the natives were converted to Christianity.

The princes who ruled after him seem to have been of the same line with the kings of Scotland, with which country they had a great intercourse, assisting its monarchs in their wars, and having the education of their princes confided to them in time of peace.

In the beginning of the seventh century, Edwin king of Northumberland invaded the Menavian islands, ravaged Man, and kept it for some time, when, Beda assures us, there were in it about 300 families; which was less than a third part of the people in Anglesey, though Man wants but a third of the size of that island.

The second line of their princes they derive from Orri, who, they say, was the son of the king of Norway; and that there were 12 princes of this house who governed Man. The old constitution, settled by the Druids, while they swayed the sceptre, was perfectly restored; the country was well cultivated and well peopled; their subjects were equally versed in the exercise of arms and in the knowledge of the arts of peace: in a word, they had a considerable naval force, an extensive commerce, and were a great nation, tho' inhabiting only a little isle. Guttred the son of Orri built the castle of Ruffyn, A. D. 960, which is a strong place, a large palace, and has subsisted now above 800 years. Macao was the ninth of these kings, and maintained an unsuccessful struggle against Edgar, who reduced all the little sovereigns of the different parts of Britain to own him for their lord; and who, upon the submission of Macao, made him his high-admiral, by which title (*archipirata*, in the Latin of those times) he subscribes that monarch's charter to the abbey of Glastonbury.

After the death of Edward the Confessor, when Harold, who possessed the crown of England, had defeated the Norwegians at the battle of Stamford, there was amongst the fugitives one Goddard Crownan, the son of Harold the Black, of Iceland, who took shelter in the isle of Man. This isle was then governed by another Goddard, who was a descendant from Macao, and he gave him a very kind and friendly reception. Goddard Crownan, during the short stay he made in the island, perceived that his name-sake

was universally hated by his subjects; which inspired him with hopes that he might expel the king, and become master of the island. This he at last accomplished, after having defeated and killed Fingal the son of Goddard, who had succeeded his father. Upon this he assigned the north part of the island to the natives, and gave the south to his own people; becoming, in virtue of his conquest, the founder of their third race of princes. However he might acquire his kingdom, he governed it with spirit and prudence; made war with success in Ireland; gained several victories over the Scots in the Isles; and, making a tour through his new-obtained dominions, deceased in the island of Islay. He left behind him three sons. A civil war breaking out between the two eldest, and both of them deceasing in a few years, Magnus king of Norway coming with a powerful fleet, possessed himself of Man and the isles, and held them as long as he lived; but, being slain in Ireland, the people invited home Olave, the youngest son of Goddard Crownan, who had fled to the court of England, and been very honourably treated by Henry the Second. There were in the whole nine princes of this race, who were all of them feudatories to the kings of England; and often resorted to their court, were very kindly received, and had pensions bestowed upon them. Henry III. in particular, charged Olavo, king of Man, with the defence of the coasts of England and Ireland; and granted him annually for that service 40 marks, 100 measures of wheat, and five pieces of wine. Upon the demise of Magnus, the last king of this isle, without heirs male, Alexander III. king of Scots, who had conquered the other isles, seized likewise upon this; which, as parcel of that kingdom, came into the hands of Edward I. who directed William Huntercumbe, guardian or warden of that isle for him, to restore it to John Baliol, who had done homage to him for the kingdom of Scotland.

But it seems there was still remaining a lady named *Austrica*, who claimed this sovereignty, as cousin and nearest of kin to the deceased Magnus. This claimant being able to obtain nothing from John Baliol, applied herself next to king Edward, as the superior lord. He, upon this application, by his writ, which is yet extant, commanded both parties, in order to determine their right, to appear in the king's-bench. The progress of this suit does not appear; but we know farther, that this lady, by a deed of gift, conveyed her claim to Sir Simon de Montacute; and, after many disputes, invasions by the Scots, and other accidents, the title was examined in parliament, in the seventh of Edward III. and solemnly adjudged to William de Montacute; to whom, by letters-patent, dated the same year, that monarch released all claim whatsoever.

In the succeeding reign, William Montacute, earl of Salisbury, sold it to Sir William Scroop, afterwards earl of Wiltshire; and, upon his losing his head, it was granted by Henry IV. to Henry Percy, earl of Northumberland; who, being attainted, had, by the grace of that king, all his lands restored, except the isle of Man, which the same monarch granted to Sir John Stanley, to be held by him of the kings his

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heirs and successors, by homage, and a cast of falcons to be presented at every coronation. Thus it was possessed by this noble family, who were created earls of Derby, till the reign of queen Elizabeth; when, upon the demise of earl Ferdinand, who left three daughters, it was, as lord Coke tells us, adjudged to those ladies, and from them purchased by William earl of Derby, the brother of Ferdinand, from whom it was claimed by descent, and adjudged to its present possessor, his grace the duke of Athol.

This island, from its situation directly in the mouth of the channel, is very beneficial to Britain, by lessening the force of the tides, which would otherwise break with far greater violence than they do at present. It is frequently exposed to very high winds; and at other times to mists, which, however, are not at all unwholesome. The soil towards the north is dry and sandy, of consequence unfertile, but not unimprovable; the mountains, which may include near two-thirds of the island, are bleak and barren; yet afford excellent peat, and contain several kinds of metals. They maintain also a kind of small swine, called *purrs*, which are esteemed excellent pork. In the valleys there is as good pasture, hay, and corn, as in any of the northern counties; and the southern part of the island is as fine soil as can be wished. They have marl and lime-stone sufficient to render even their poorest lands fertile; excellent slate, rag-stone, black marble, and some other kinds for building. They have vegetables of all sorts, and in the utmost perfection; potatoes in immense quantities; and, where proper pains have been taken, they have tolerable fruit. They have also hemp, flax, large crops of oats and barley, and some wheat. Hogs, sheep, goats, black cattle, and horses, they have in plenty; and, though small in size, yet if the country was thoroughly and skilfully cultivated, they might improve the breed of all animals, as experience has shown. They have rabbits and hares very fat and fine; tame and wild fowl in great plenty; and in their high mountains they have one airy of eagles and two of excellent hawks. Their rivulets furnish them with salmon, trout, eels, and other kinds of fresh-water fish; on their coasts are caught cod, turbot, ling, halibut, all sorts of shell-fish (oysters only are scarce, but large and good), and herrings, of which they made anciently a great profit, though this fishery is of late much declined.

The inhabitants of Man, though far from being unmixed, were, perhaps, till within the course of the present century, more so than any other under the dominion of the crown of Great Britain; to which they are very proud of being subjects, though, like the inhabitants of Jersey and Guernsey, they have a constitution of their own, and a peculiarity of manners naturally resulting from a long enjoyment of it.—The Manks tongue is the only one spoken by the common people. It is the old British, mingled with Norse, or the Norwegian language, and the modern language. The clergy preach and read the common prayer in it. In ancient times they were distinguished by their stature, courage, and great skill in maritime affairs. They are at this day a brisk, lively, hardy, industrious, and well-meaning people. Their frugality defends them

from want: and though there are few that abound, there are as few in distress; and those that are, meet with a cheerful unconstrained relief. On the other hand, they are choleric, loquacious, and, as the law till lately was cheap, and unincumbered with solicitors and attornies, not a little litigious. The revenue, in the earl of Derby's time, amounted to about 2500*l.* a year; from which, deducting his civil list, which was about 700*l.* the clear income amounted to 1800*l.* At the same time, the number of his subjects was computed at 20,000.—The sovereign of Man, though he has long ago waved the title of *king*, was still invested with regal rights and prerogatives; but the distinct jurisdiction of this little subordinate royalty, being found inconvenient for the purposes of public justice, and for the revenue (it affording a commodious asylum for debtors, outlaws, and smugglers), authority was given to the treasury, by stat. 12 Geo. I. c. 28. to purchase the interest of the then proprietors for the use of the crown: which purchase was at length completed in the year 1765, and confirmed by stat. 5. Geo. III. c. 26. and 39.; whereby the whole island and all its dependencies (except the landed property of the Athol family), their manorial rights and emoluments, and the patronage of the bishopric and other ecclesiastical benefices, are unalienably vested in the crown, and subjected to the regulation of the British excise and customs. The duke, however, is procuring an act of parliament to revise the former one.

The most general division of this island is into north and south; and it contains 17 parishes, of which five are market-towns, the rest villages. Its division with regard to its civil government, is into six sheedings, every one having its proper coroner, who is in the nature of a sheriff, is intrusted with the peace of his district, secures criminals, brings them to justice, &c. The lord chief-justice Coke says, "their laws were such as scarce to be found any where else." In July 1786, a copper coinage for the use of the island was issued from the Tower of London.—There is a ridge of mountains runs almost the length of the isle, from whence they have abundance of good water from the rivulets and springs; and Snafield, the highest, rises about 580 yards. The air is sharp and cold in winter, the frosts short, and the snow, especially near the sea, lies not long on the ground. Here are quarries of good stone, rocks of lime-stone, and red free-stone, and good slate, with some mines of lead, copper, and iron. The trade of this island was very great before the year 1726; but the late lord Derby farming out his customs to foreigners, the insolence of those farmers drew on them the resentment of the government of England, who, by an act of parliament, deprived the inhabitants of an open trade with this kingdom. This naturally introduced a clandestine commerce, which they carried on with England and Ireland with prodigious success, and an immense quantity of foreign goods was run into both kingdoms, till the government in 1765 thought proper to put an entire stop to it, by purchasing the island of the duke of Athol, as already mentioned, and permitting a free trade with England. On the little isle of Peele, on the west side of Man, is a town of the same name, with a fortified castle.

Man.

Man.

castle. Before the south promontory of Man, is a little island called the *Calf of Man*: it is about three miles in circuit, and separated from Man by a channel about two furlongs broad. At one time of the year it abounds with puffins, and also with a species of ducks and drakes, by the English called *barnacles*, and by the Scots *clakes* and *Soland geese*.

The inhabitants of this isle are of the church of England; and the bishop is styled *Bishop of Sodor and Man*. This bishoprick was first erected by Pope Gregory IV. and for its diocese had this isle and all the Hebrides, or Western islands of Scotland; but which were called *Sodoroc* by the Danes, who went to them by the north, from the Swedish Sodor, Sail or Oar islands, from which the title of the bishop of Sodor is supposed to originate. The bishop's seat was at Rushin, or Castletown, in the isle of Man, and in Latin is entitled *Sodorensis*. But when this island became dependent upon the kingdom of England, the Western islands withdrew themselves from the obedience of their bishop, and had a bishop of their own, whom they entitled also *Sodorensis*, but commonly *Bishop of the Isles*. The patronage of the bishopric was given, together with the island, to the Stanleys by king Edward IV. and came by an heir-female to the family of Athole; and, on a vacancy thereof, they nominated their designed bishop to the king, who dismissed him to the archbishop of York for consecration.—By an act of parliament, the 33d of king Henry VIII. this bishopric is declared in the province of York.

MAN-of-war Bird. See PELICANUS.

MANAGE. See MANEGE.

MANASSEH (in Scripture hist.), the eldest son of Joseph, and grandson of the patriarch Jacob (Gen. xli. 50, 51.) was born in the year of the world 2290, before Jesus Christ 1714.

The tribe descended from him came out of Egypt, in number 32,200 men, fit for battle, upwards of 20 years old, under the conduct of Gamaliel son of Pedahzur (Numb. ii. 20, 21.) This tribe was divided at their entrance into the land of Promise. One half had its portion beyond the river Jordan, and the other half on this side the river. The half tribe of Manasseh which settled beyond the river possessed the country of Bashan, from the river Jabbok to mount Libanus, (Numb. xxii. 33, 34, &c. ;) and the other half tribe of Manasseh on this side Jordan, obtained for its inheritance the country between the tribe of Ephraim to the south, and the tribe of Issachar to the north, having the river Jordan to the east and the Mediterranean sea to the west, (Josh. xvi. xvii.)

MANASSEH, the 15th king of Judah, being the son and successor of Hezekiah. His acts are recorded in 2 Kings xx. xxi. and 2 Chr. xxxiii.

MANATI, in zoology. See TRICHECUS.

MANCA, was a square piece of gold coin, commonly valued at 30 pence; and *mancusa* was as much as a mark of silver, having its name from *manu-cusa*, being coined with the hand: (*Leg. Canut.*) But the *manca* and *mancusa* were not always of that value; for sometimes the former was valued at six shillings, and the latter, as used by the English Saxons, was equal in value to our half-crown. *Manca sex solidis aestimetur*, (*Leg. H. 1. c. 69.*) Thorn, in his chronicle, tells us,

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that *mancusa est pondus duorum solidorum et sex denariorum*; and with him agrees Du Cange, who says, that 20 *manca* make 50 shillings. *Manca* and *mancusa* are promiscuously used in the old books for the same money.

MANCHA, a territory of Spain in the province of New Castile, lying between the river Guadiana and Andalusia. It is a mountainous country; and it was here that the famous Don Quixote was supposed to perform his exploits.

MANCHESTER, a town of Lancashire in England, situated in W. Long. 2. 42. N. Lat. 53. 27.—Mr Whitaker conjectures, that the station was first occupied by the Britons about 500 B. C. but that it first received any thing like the form of a town 450 years after, or 50 B. C. when the Britons of Cheshire made an irruption into the territories of their southern neighbours, and of consequence alarmed the Sestuntii, or inhabitants of Lancashire, so much, that they began to build fortresses in order to defend their country. Its British name was *Mancenion*; which was changed by the Romans, who conquered it under Agricola, A. D. 79, into *Mancunium*; from whence comes the present name of *Manchester*.—It is 182 miles from London; and stands near the conflux of the Irk and the Irwell, three miles from the Mersey. It is large, populous, and adorned with many fine buildings and streets. It has a spacious market-place, a college; and an exchange. The fustian manufactory, called *Manchester-cottons*, for which it has been famous for near 200 years, has been much improved of late by some inventions of dyeing and printing, which, with the great variety of other manufactures, called *Manchester goods* (of which they export vast quantities abroad, especially to the West Indies), such as ticking, tapes, filleting, and linen-cloth, enrich the town, and employ men, women, and children. It has two churches, viz. St Mary's and St Anne's. The latter was begun by contribution of the inhabitants, in the reign of Queen Anne, and finished in 1723. The collegiate church, which was built in 1422, is a fine large edifice, with a beautiful choir, and a clock that shows the age of the moon. The three most eminent foundations here are, its college, hospital, and public school. The college was founded in 1421. The king, by act of parliament in 1729, is impowered to be visitor of this college. The hospital was founded by Humphry Cheetham, Esq; and incorporated by Charles II. for the maintenance of 40 poor boys of this town and the neighbouring parishes; but the governors have enlarged the number to 60, to be taken in between six and ten years of age, and maintained, lodged, and clothed, till the age of 14, when they are to be bound apprentices at the charge of the said hospital. The founder also erected a library in it, and settled 116 l. a-year on it for ever, to buy books, and to support a librarian. There is a large school for the hospital boys, where they are taught to read, write, &c. The public school was founded anno 1513. Here are three masters, with handsome salaries; and the foundation boys have certain exhibitions for their maintenance at the university. Besides these, there are three charity schools. It stands on a stony hill, where are noble quarries. *Kersal-moor* is noted for horse.

Man
||
Mancu-
nium,

horse-races. This place, in fine, is deservedly reckoned the greatest village or market-town in England: for though its chief magistrate is only a constable or headborough, yet it is more populous than York, Norwich, or most cities in England, and as big as two or three of the lesser ones put together; for of the people, including those in the suburbs, there were reckoned not less than 20,000 communicants above 100 years ago, and now the inhabitants are not less than 50,000. Here is a firm old stone-bridge over the Irwell, which is built exceedingly high; because, as the river comes from the mountainous parts of the country, it rises sometimes four or five yards in one night, but falls next day as suddenly. There are for three miles above the town no less than 60 mills upon it. By the late inland navigation, it has communication with the rivers Mersey, Dee, Ribble, Ouse, Trent, Darwent, Severn, Humber, Thames, Avon, &c. which navigation, including its windings, extends above 500 miles, in the counties of Lincoln, Nottingham, York, Westmoreland, Chester, Stafford, Warwick, Leicester, Oxford, Worcester, &c. The weavers here have looms that work 24 laces at a time, an invention for which they are obliged to the Dutch. The market here is on Saturday; and the fairs are on Whit-Monday, September 21. and November 6.—It is a manor with courts leet and baron. What is now called *Knock-Castle*, was the seat of the Roman Castrum; and the foundation of the castle wall and ditch still remain in *Castle-Field*, as it is sometimes called.—The market-place, surrounded with old dirty buildings, is called the *Old Town*; and rents run very high.—Manchester sends no members to parliament, but has the title of a *duchy*.

MANCHINEEL. See HIPPOMANE.

MANCIPATIO, was a term made use of in the Roman law, and may be thus explained: every father had such a regal authority over his son, that before the son could be released from his subjection and made free, he must be three times over sold and bought, his natural father being the vender. The vendee was called *pater fiduciarius*. After this fictitious bargain, the *pater fiduciarius* sold him again to the natural father, who could then, but not till then, *manumit* or make him free. The imaginary sale was called *mancipatio*; and the act of giving liberty or setting him free after this was called *emancipatio*.

MANCIPATIO also signifies the selling or alienating of certain lands by the balance, or money paid by weight, and five witnesses. This mode of alienation took place only amongst Roman citizens, and that only in respect to certain estates situated in Italy, which were called *mancipia*.

MANCIPLE (*manceps*), a clerk of the kitchen, or caterer. An officer in the inner temple was anciently so called, who is now the steward there; of whom Chaucer, the ancient English poet, some time a student of that house, thus writes:

A manciple there was within the temple,
Of which all caterers might take ensample.

This officer still remains in colleges in the universities.

MANCUNIAM, (anc. geog.), a town of the Brigantes in Britain. Now *Manchester* in Lancashire.

MANCUS (formed of *manu cusus*), in antiquity, an Anglo-Saxon gold coin, equal in value to 2 $\frac{1}{2}$ solidi, or 30 pence; and in weight to 55 Troy grains. The first account of this coin that occurs in the history of our country, is about the close of the 8th century, in an embassy of Cenwulf king of Mercia to Leo III. requesting the restoration of the jurisdiction of the see of Canterbury: this embassy was enforced by a present of 120 mancuses. Ethelwolf also sent yearly to Rome 300 mancuses: and these coins are said to have continued in some form or other till towards the conclusion of the Saxon government. The heriots of the nobility are chiefly estimated by this standard in Canute's laws. It came originally from Italy, where it was called *ducat*: and is supposed to have been the same with the drachma or miliarenfis current in the Byzantine empire.

MANDAMUS, in law, a writ that issues out of the court of king's-bench, sent to a corporation, commanding them to admit or restore a person to his office. This writ also lies where justices of the peace refuse to admit a person to take the oaths in order to qualify himself for enjoying any post or office; or where a bishop or archdeacon refuses to grant a probate of a will, to admit an executor to prove it, or to swear a church-warden, &c.

MANDANES, an Indian prince and philosopher, who for the renown of his wisdom was invited by the ambassadors of Alexander the Great to the banquet of the son of Jupiter. A reward was promised him if he obeyed, but he was threatened with punishment in case of a refusal. Unmoved by promises and threatenings, the philosopher dismissed them with observing, that though Alexander ruled over a great part of the universe, he was not the son of Jupiter; and that he gave himself no trouble about the presents of a man who possessed not wherewithal to content himself. "I despise his threats (added he): if I live, India is sufficient for my subsistence; and to me death has no terrors, for it will only be an exchange of old age and infirmity for the happiness of a better life."

MANDARINS, a name given to the magistrates and governors of provinces in China, who are chosen out of the most learned men, and whose government is always at a great distance from the place of their birth.—*Mandarin* is also a name given by the Chinese to the learned language of the country; for besides the language peculiar to every province, there is one common to all the learned in the empire, which is in China what Latin is in Europe; this is called the *mandarin tongue*, or the *language of the court*.

MANDATE, in law, a judicial commandment to do something. See the article MANDAMUS.

MANDATE, in the canon law, a rescript of the pope commanding an ordinary collator to put the person therein named in possession of the first vacant benefice in his collation.

MANDATUM, was a fee or retainer given by the Romans to the *procuratores* and *advocati*. The *mandatum* was a necessary condition, without which they had not the liberty of pleading. Thus the legal eloquence of Rome, like that of our own country, could not be unlocked without a golden key.

MANDERSCHEIT, a town of Germany in the circle

Mancus
||
Manders-
scheit.

Mandeville circle of the Lower Rhine, and in the electorate of
 ||
 Triers, capital of a county of the same name, between
 Manege. the diocese of Triers and the duchy of Juliers. E.
 Long. 6. 32. N. Lat. 50. 20.

MANDEVILLE (Sir John), a physician, famous for his travels, was born at St Alban's, about the beginning of the 14th century. He had a liberal education, and applied himself to the study of physic; but being at length seized with an invincible desire of seeing distant parts of the globe, he left England in 1332, and did not return till 34 years after. His friends, who had long supposed him dead, did not know him when he appeared. He had travelled through almost all the east, and made himself master of a great variety of languages. He particularly visited Scythia, Armenia the Greater and Less, Egypt, Arabia, Syria, Media, Mesopotamia, Persia, Chaldea, Greece, Dalmatia, &c. His rambling disposition did not suffer him to rest; for he left his own country a second time, and died at Liege in the Netherlands in 1372. He wrote *An Itinerary, or an Account of his Travels*, in English, French, and Latin.

MANDEVILLE (Bernard de), an eminent writer in the 18th century, was born in Holland, where he studied physic, and took the degree of doctor in that faculty. He afterwards came over into England, and in 1714 published a poem, intitled, "*The Grumbling Hive, or Knaves turned Honest*;" upon which he afterwards wrote remarks, and published the whole at London, 1723, in 8vo, under the title of, "*The Fable of the Bees, or private Vice made public Benefits; with an Essay on Charity and Charity-schools, and a Search into the Nature of Society*." This book was presented by the jury of Middlesex in July the same year, and severely animadverted upon in "*A Letter to the Right Honourable Lord C.*" printed in the *London Journal of Saturday July 27, 1723*. Our author published a *Vindication*. His book was attacked by several writers. He published other pieces, and died in 1724.

MANDRAGORA, in botany. See **ATROPA**.

MANDRAKE, in botany. See **ATROPA** and **MUSA**.

MANDREL, a kind of wooden pulley, making a member of the turner's lathe. Of these there are several kinds; as *Flat Mandrels*, which have three or more little pegs or points near the verge, and are used for turning flat boards on. *Pin Mandrels*, which have a long wooden shank to fit into a round hole made in the work to be turned. *Hollow Mandrels*, which are hollow of themselves, and used for turning hollow work. *Screw Mandrels*, for turning screws, &c.

MANE, the hair hanging down from a horse's neck; which should be long, thin, and fine; and if frizzled, so much the better.

MANEGE, or **MANAGE**, the exercise of riding the great horse; or the ground set apart for that purpose; which is sometimes covered, for continuing the exercise in bad weather; and sometimes open, in order to give more liberty and freedom both to the horseman and horse. See **HORSEMANSHIP**.

The word is borrowed from the French *manage*, and that from the Italian *maneggio*; or, as some will have it, *a manu agendo*, "acting with the hand."

MANES, a poetical term, signifying the shades or souls of the deceased. The heathens used a variety of ceremonies and sacrifices to appease the manes of those who were deprived of burial. See **LEMURES** and **LEMURIA**.

Dii MANES were the same with *inferi*, or the infernal gods, who tormented men; and to these the heathens offered sacrifices to assuage their indignation.

The heathen theology is a little obscure with regard to these gods manes. Some hold, that they were the souls of the dead; others, that they were the genii of men; which last opinion suits best with the etymology of the word.

The heathens, it is pretty evident, used the word *manes* in several senses; so that it sometimes signified the ghosts of the departed, and sometimes the infernal or subterraneous deities, and in general all divinities that presided over tombs.

The evocation of the manes of the dead seems to have been very frequent among the Thessalians; but it was expressly prohibited by the Romans. See **LARES**.

MANES, the founder of the Manichæan system. See **MANICHEES**.

MANETHO, an ancient Egyptian historian, who pretended to take all his accounts from the sacred inscriptions on the pillars of *Hermes Trismegistus*. He was high priest of Heliopolis in the time of Ptolemy Philadelphus, at whose request he wrote his history in Greek; beginning from their gods, and continuing it down to near the time of Darius Codomanus who was conquered by Alexander the Great. His history of Egypt is a celebrated work, that is often quoted by Josephus and other ancient authors. Julius Africanus gave an abridgment of it in his *Chronology*. Manetho's work is however lost; and there only remain some fragments extracted from Julius Africanus, which are to be found in Eusebius's *Chronica*.

MANFREDI (Eustachio), a celebrated mathematician, born at Bologna in 1674, where he was elected mathematical professor in 1698. He was made a member of several academies, and acquired great reputation by his *Ephemerides*, 4 vols 4to, as well as by other works. He died in 1739.

MANFREDONIA, a port town of Naples, on the Gulph of Venice, which arose on the ruins of the ancient Sipontum; (see the article **SIPONTUM**). It received its name from its founder *Manfred*; who transplanted hither the few inhabitants that remained at Sipontum, and attracted other settlers to it by various privileges and exemptions. In order to found it under the most favourable auspices, he called together all the famous professors of astrology (a science in which both he and his father placed great confidence), and caused them to calculate the happiest hour and minute for laying the first stone. He himself drew the plans, traced the walls and streets, superintended the works, and by his presence and largesses animated the workmen to finish them in a very short space of time. The port was secured from storms by a pier, the ramparts were built of the most solid materials, and in the great tower was placed a bell of so considerable a volume as to be heard over all the plain of Capitanata, in order to alarm the country in case of

Manes
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 Manfredonia.

Manganese an invasion. Charles of Anjou afterwards removed the bell to Bari, and offered it at the shrine of St Nicholas, as a thanksgiving for the recovery of one of his children. In spite of all the precautions taken by Manfred to secure a brilliant destiny to his new city, neither his pains, nor the horoscopes of his wizards, have been able to render it opulent or powerful. At present, Mr Swinburn informs us, it scarce musters six thousand inhabitants, though most of the corn exported from the province is shipped off here, and a direct trade carried on with Venice and Greece, for which reason there is a lazaretto established; but from some late instances we may gather, that if the kingdom of Naples has for many years past remained free from the plague, it is more owing to good luck, and the very trifling communication with Turkey, than to the vigilance or incorruptibility of the officers of this port. In 1620, the Turks landed and pillaged Manfredonia. All sorts of vegetables abound here, for flavour and succulency infinitely superior to those raised by continual waterings in the cineritious soil of Naples. Lettuce in particular is delicious, and fish plentiful and cheap.

MANGANESE, or **MAGNESIA NIGRA**, a dark-coloured mineral employed in glass-works for purifying the glass, by taking away the colour it has already, or by superadding a new colour to it. It is also used in the glazing of earthen ware, where it communicates a black colour. From its property of rendering glass colourless, it has sometimes been called the soap of glass.

This substance, commonly called *black* or *glass-maker's manganese*, is scarcely any other thing than the calx of a new semimetal, whose properties were for the first time investigated by Mr Scheele in the Stockholm Memoirs for 1774: afterwards it was more fully investigated by Dr Gahn, and lately by several other chemists. Its colour is of a dusky white; and the surface is uneven and irregular, owing to its imperfect fusion. It is bright and shining when first broken, but tarnishes by exposure to air much sooner than any other metallic substance. Its specific gravity is 6,850: it equals, if it does not exceed, iron in hardness, as well as difficulty of fusion. When reduced to powder, it becomes magnetical, though large pieces of it are not so. When exposed to the air, it soon crumbles into a blackish brown powder, somewhat heavier than the regulus itself; and this effect is sooner produced in a moist than a dry air.

The regulus is obtained by making the calx or ore of manganese into a ball with pitch, and putting it into a crucible with powdered charcoal one-tenth of an inch thick on the sides and a quarter of an inch at the bottom. The empty space is then to be filled with powdered charcoal, covering the crucible with another. Having luted the joints, the whole is to be exposed to the strongest heat of a forge for an hour or more. This regulus is soluble in all the acids, but most readily in the nitrous, the solution in which is generally of a brownish colour, though that in the others is mostly colourless. The brown colour in the nitrous solution arises from the mixture of a small portion of iron, and there is always a black residuum resembling plumbago left undissolved. Aerated alkalies throw down a white

precipitate from these solutions, which by heat grows **Manganese** black, and is converted into the original calx of the metal.

Regulus of manganese melts readily with other metals, mercury alone excepted. Copper, united with a certain quantity of it, is extremely malleable; but scarce any traces of the red colour are to be seen on the surface when polished, but the mixture sometimes has a green efflorescence by age. Its decomposition by air is very remarkable. A piece of it newly made, when put into a dry bottle well corked, remained perfect for six months; but afterwards, when exposed only for two days to the open air of a chamber, contracted a brown colour on the surface, and became so friable as to crumble into powder between the fingers, the internal parts only retaining an obscure metallic splendour, which also disappeared in a few hours.

This surprising facility of decomposition might naturally lead us to suppose that no such thing as native manganese could exist in the earth. In the *Journal de Physique* for January 1786, however, M. de Peyrouse gives an account of a native regulus of manganese, the properties of which are as follow: 1. In appearance it very much resembles the artificial regulus already mentioned. 2. It dirties the fingers by handling. 3. None of its particles are in the least affected by the magnet. 4. It is composed of laminae having a kind of divergence among themselves. 5. Its metallic brilliancy is the same with that of the artificial regulus, and it has a partial malleability. 6. When repeatedly hammered, it exhibits a kind of exfoliation, forming itself into very thin leaves. 7. Its opacity and density are so completely similar to the artificial regulus, that were it not for the matrix in which the latter is imbedded, it would be in a manner impossible to distinguish them.

This regulus is not found in large masses, or in any solid continuous body, but only in clots or lumps inclosed and intermixed with the powdery or calciform ore. These lumps are somewhat flattened or compressed in their form like the artificial ones, though for the most part they are of a larger size. This powdery magnesian ore, in which the reguline lumps are imbedded, has an argentine hue, as if the materials had been subjected to some violent heat upon the spot.— This regulus was found among the iron mines of *Sem*, in the valley of *Viedorfos*, in the county of Foix, near the Pyrenean mountains.

Manganese is found in a calciform state, of various colours. M. de Magellan observes, that the aerial acid is the only mineralizer of this semimetal in its dry state; and that in proportion to the different degrees of phlogification, a variety of colours is produced. When it contains as much phlogiston as possible, without being reduced to a regulus, it always appears of a white colour, and contains about 40 per cent. of fixed air. In proportion to its dephlogification and union with other substances, its colour is either blue, green, yellow, red, or black.

The black manganese seems to be the decayed particles of that which is indurated. The latter is met with either pure, or in form of balls seemingly composed of concentric fibres; sometimes, but very rarely, it is met with of a white colour. Cronstedt informs us, that he had a specimen of this from an unknown place

in

Manganese in Norway. He found that it differed from the common kind by giving a deep red colour to borax in the fire. By calcination it assumes a reddish brown colour.

Blue manganese, according to Mr Scheele, acquires its colour from the phlogiston which it is enabled to retain by its union with fixed alkalis. Green arises from a mixture of the blue with the yellow calx of iron, and the yellow colour, from a prevalence of this calx; red from a slight dephlogistication of the calx; and black from a thorough dephlogistication of it.—The white kind, above mentioned, contains but a very small proportion of iron. Rinman found it both in small white crystals and in round masses in the cavities of quartz, and adhering to glanz-blende. The hardness rather less than limestone, the texture sparry, and the substance scarcely magnetic even after roasting: it affords a colourless solution with nitrous acid, from which mild alkalis throw down a white precipitate turning black with heat, as already mentioned, of the regulus itself. The white ore has also been found vegetating on the surface of some iron ores, particularly hæmatites. Mr Rinman also met with it in the form of calcareous spar of the colour of rosin, somewhat shining, and covered over in some places with a footy powder. It is found also in thin pieces, transparent at the edges, but not hard enough to strike fire. This consists of manganese bedded in zeolite. It melts *per se* with the heat of a blow-pipe into a whitish grey porous slag; and with the addition of calcined borax gives a garnet colour to glass. According to Kirwan, many of the white sparry iron ores may be classed among those of manganese, as they contain more of this ferri-metal than of iron.

Red manganese is said to be found in Piedmont, but Cronstedt says he never saw it. He was told by an ingenious workman, that this variety is free from iron, and gives rather a red than violet colour to glass. Mr Kirwan says, that this kind has less fixed air and more iron than the white kind. It is also joined with ponderous earth, calcareous earth, ponderous spar, and flint. It is found either loose or semi-indurated, in a matrix of calcareous spar, on talcky schistus, or on hæmatites or other iron ores. It is found likewise in heavy hard masses of lamellar, radiated, or equable texture, or crystallized in pyramids, rhomboids, or short brittle needles.

Manganese is also met with in a state of union with iron. This is black, with a metallic splendour, and is the kind commonly employed in glass-houses and potteries. There are several varieties of this stone in the mountains round Bath named Mendip-hills, of which the Bristol potters consume great quantities. The black ores of manganese differ but little from the brown ones. They are both found either crystallized as the red ores, or in solid masses, some of which have a metallic appearance; but others are dull, earthy, and mixed, or embodied in quartz, or in a loose earthy form. Their specific gravity is about 4.000. The black manganese is met with either solid and of a slaggy texture, steel-grained, radiated, or crystallized.

The Perigord stone belongs to this species of manganese. It is of a dark grey colour like the basalt, and may be scraped with a knife, but cannot be broken without difficulty.

It is very compact, heavy, and as black, internally, as charcoal. It has a glittering appearance of a striated kind, like the ore of antimony; and its particles are disposed in the form of needles crossing one another without any agglutination, in so much that some are loose in a manner similar to iron filings when stuck to a loadstone, and resembling on the whole the scoria from a blacksmith's forge. By calcination this substance assumes a reddish brown colour, and becomes harder, but is not magnetic. It does not melt *per se*, but affords an amethyst-coloured glass with borax. Nitrous acid has little effect upon it without sugar. It seems to contain clay and some iron, and is of considerable specific gravity. It is found in some parts of England as well as in Gascony and Dauphiny in France. The French potters and common enamellers sometimes employ this substance in the glazing of their ware.

Black-wadd is likewise an ore of manganese. It is found in Derbyshire, and is of a dark brown colour, partly in powder, and partly indurated and brittle. If half a pound of it be dried before the fire, and afterwards suffered to cool for an hour, and two ounces of linseed oil afterwards added, mixing the whole loosely like barm with flour, little clots will be formed, and, in something more than half an hour the whole will grow hot, and at last burst into flame. The heat of the room in which this experiment was tried might be about 30° of Fahrenheit, and the heat to which it was exposed in drying about 130. According to Wedgwood's Analysis, this ore contains 43 parts of manganese, as much iron, 4½ of lead, and near 5 of micaceous earth.

Besides the ores mentioned above, Mr Scheele informs us, that he has found manganese existing in potashes. Chemists, he tells us, have often observed, that alkaline salts, when calcined, assume a bluish or greenish colour. The cause of this has been said to be a quantity of phlogiston present in the alkali; but to this he objects, that such a colour is not destroyed by fusion with nitre. When fixed alkali is made to run over the crucible by too strong a fire, the part that attaches itself to the outside acquires a dark-green colour in consequence of the ashes uniting with it. If one part of alkali of tartar be mixed with one-fourth of fine sifted ashes and one-eighth of nitre, a dark-green mass is obtained, which, by solution in water, affords a beautiful green solution, and, when filtered, turns red on the addition of a few drops of vitriolic acid. Some days afterwards a small quantity of brown powder falls to the bottom, which discovers the same chemical properties as manganese. On dissolving a quantity of sifted ashes in muriatic acid by digestion in a sand-heat, the same smell of aqua-regia arises that is perceived on mixing manganese with spirit of salt. Adding some hours afterwards a certain quantity of vitriolic acid, in order to precipitate the greater part of the calcareous earth, the liquor had a yellow colour when filtered, and by means of fixed alkali let fall a yellow precipitate, which by calcination turned of a dark-grey, and showed signs of containing manganese. Hence it appears that manganese really exists in the ashes of vegetables, but not equally in all; for Mr Scheele observes, that wood-ashes contain much more than those of thyme (*thymus serpyllum*).

Manganese

Mr Scheele has laboured exceedingly to decompose this substance, and to discover its component parts. He candidly acknowledges, however, that he did not succeed in this investigation according to his wish, and therefore cannot be certain that his conclusions are altogether just. The following experiments, however, he tells us, were made with the greatest accuracy as well as expence of time and trouble.

Half an ounce of phlogisticated manganese, purified from all foreign particles, was calcined upon an iron-plate till it grew black. It was then dissolved in diluted vitriolic acid, with the addition of a little sugar, in a sand heat till the solution became limpid. On cooling, a fine shining powder precipitated, which proved to be selenite. Having separated this by filtration, and then diluted the solution with six ounces of distilled water, precipitating it afterwards by vegetable alkali, the powder wasedulcorated, and again exposed to calcination (A). The manganese, when deprived of its phlogiston, was again dissolved by means of sugar in diluted vitriolic acid; by which means as much selenite was obtained as before. The filtered solution was treated exactly in the same manner, and the operation repeated eleven times, yielding to appearance as much selenite as before. On weighing the results of all these calcinations, the manganese was found to be reduced to three drachms and five grains, and the quantity of selenite had increased to 49 grains; the whole seems therefore to be convertible into calcareous earth. On attempting to invert the experiment, and to produce manganese by combining phlogiston with calcareous earth, he found it impossible to unite the two substances by any means he could devise.

This analysis of manganese was undertaken at the desire of Mr Bergman; who having informed him that Mr Sage supposes manganese to be nothing else than a mineralised mixture of cobalt and zinc, he afterwards made several experiments with a view to detect these substances, but in vain. "Manganese (says Mr Bergman) has been classed by all mineralogists among the ores of iron; but Mr Pott supposed the iron to be only accidentally mixed with it; and at last Mr Cronstedt, in his Essay on Mineralogy, 1758, placed it among the earths. For my part, however, I must own that there are several circumstances which make me think that it is a metallic substance. No pure earth colours glass, but all metallic calces have this property. Manganese, therefore, in this respect, shows a great resemblance to the latter; which is further increased by its specific gravity, and its strong attraction for phlogiston." Having then mentioned its precipitation by the Prussian alkali as an additional proof of its metallic nature, he proceeds thus: "But what kind of metal it is which manganese contains is not so easily ascertained. The solution of cobalt does not lose its colour on adding sugar or any other phlogistic substance, and zinc does not impart any colour to acids. These two substances consequently differ from manganese, which does not indeed entirely agree with any other of the known metallic earths. I have, however, great reason to conjecture that it

must be platina, the earth of which is not yet known; Manganese or a new metal, which at least would agree with platina in the great difficulty with which it fuses."

It has already been observed, that manganese is used in glass-works, and is capable both of destroying the colour of glass, and of giving a new colour to it, viz. that of violet. Mr Scheele deduces its operation from the properties related under the article CHEMISTRY, n° 1359 & seq. He enumerates its effects on glass-fluxes as follows: 1. A colourless glass-flux becomes constantly more or less red on addition of manganese, according to the quantity. 2. If the flux be a little alkaline, the colour will approach to violet. 3. Arsenic, gypsum, and calx of tin, destroy the red colour in these glasses, and thus render them clear. The action of arsenic is easily explained from CHEMISTRY, n° 919. where it is shown that manganese decomposes arsenic by uniting with its phlogiston, and that arsenic itself is composed of an acid of a peculiar nature united with phlogiston. On mixing manganese, therefore, with glass in fusion, the phlogiston of the arsenic unites with the manganese, while the acid of arsenic unites with the alkali of the glass. This experiment succeeds in a covered crucible, though never when gypsum or calx of tin are made use of; but on adding powdered charcoal, an effervescence ensues, the red colour disappears, and the glass becomes colourless. The phlogiston of the charcoal is therefore the cause of the destruction of the colour, and the effervescence is a necessary consequence of the emission of the phlogiston. 4. If glass coloured red by manganese be fused in a crucible with powdered charcoal, the colour disappears during the effervescence without the addition of gypsum or calx of tin; but on keeping the glass a long time in fusion upon charcoal, by means of the blow-pipe, the colour does not disappear. Nay, if the colourless glass be kept in this state for a short time upon charcoal, it grows red again. 5. By adding a little sulphur, the colour disappears; and the same thing takes place on the addition of any metallic calx or any neutral salt containing the vitriolic acid. But here it must be observed, that all metals whose calces colour glass, while they deprive it of that which it has received from the manganese, will not fail to communicate their own peculiar colour to it. If to such a colourless glass-globule, nitre, even in the smallest quantity, be added, it presently grows red again; and the same thing happens if such a colourless glass globule be kept in fusion for a few minutes upon an iron plate; and thus the red colour may be made to appear and disappear as often as we please.

From this explanation it appears how manganese purifies glass. When the colour of it depends on a quantity of coaly matter, it is improper to add more than is just sufficient to saturate the phlogiston. With regard to the green colour of common bottle-glass, Mr Scheele made the following experiment to determine whether it proceeded from iron or not. Having melted green glass by the blow-pipe upon a piece of the same substance, left in using a crucible he should have been deceived by the iron it contained, he poured

(A) As in this process a quantity of fixed air is always expelled from the alkali, it was necessary, in order to prevent any of the manganese from being dissolved by it, to place the whole for some hours upon hot sand, to expel the aerial fluid.

Manganese ed upon it a large quantity of muriatic acid; and having extracted a tincture, and poured into it a few drops of the solution of Prussian alkali, it assumed a bluish colour. Hence he concludes, that iron, nearly in its metallic form, is present in common green glass; for its calx always gives a yellowish colour to glass, and manganese added to a solution of iron in acids destroys the green colour, substituting a yellow one in its room; and in like manner, nitre added to green glass in fusion takes away its colour. The same effect is produced by manganese if added in proper quantity; though, according to the experiments of Mr Scheele, somewhat of a yellowish colour ought to have been communicated by it; and he is of opinion that it was really so, though the quantity of iron was too small to render it distinctly visible. It is also remarkable, that the rays of light passing through glass of this kind, when nearly red hot, appear of a yellowish colour.

Mr Engestrom's experiments on this subject are somewhat different from those of Mr Scheele. Having melted manganese and borax together upon a piece of charcoal, the glass at first assumed the common colour of manganese; but this was repeatedly destroyed, and made to appear without adding any thing. During the operation he took notice of the following phenomena: 1. When a small quantity of manganese was taken, the colour was light, but with a larger it became nearly black; and whatever colour it assumed on the first fusion was manifested also at the second, when it was made to reappear. 2. Manganese, on being melted with borax, effervesces violently; which ceases, however, as soon as the manganese is dissolved. 3. To make the colour of the glass disappear, it was necessary only to direct the blue flame of the candle upon the glass, and that equally and constantly, but not very violently. On blowing more faintly, and allowing the brown flame to touch the place, the colour returned. 4. About the time that the glass becomes colourless, a kind of section or partition is observed in it; and as soon as the colour disappears, the blowing must be immediately discontinued, so that the brown flame shall not afterwards touch the glass. When it is taken out with the forceps, it appears perfectly colourless. 5. This destruction of the colour seems not to happen suddenly, but by degrees; for when the blowing was now and then discontinued before the true mark had appeared, the glass was generally lighter than before, though not quite colourless.

Though our author had been able to discharge the colour thus from glass, and to make it reappear, it seemed doubtful whether this could be done frequently; for having blown the blue flame violently against some glass, the colour of which he had already twice discharged and made to reappear, he found that it could not again be discharged even by constant blowing for an hour. In another experiment, having added a large quantity of manganese, he found that the glass retained its colour even in the utmost heat he could give it, though it always became colourless when warm, but regained its colour in the cold.

In both these experiments the violence of the flame had dispersed and driven off some small globules, which always remained colourless: the reason of this he thinks is, that manganese, or its colouring part, has a strong attraction for a small part only of borax; and

that, by means of a violent heat, the superfluous part may be separated, and the rest unite more closely with the earthy particles. The same thing happened likewise with the small globules, which sometimes remained after the mass was taken away, fixed to the charcoal by the violence of the flame. "If this is really the case (says he), it would follow, that by repeating the experiment some of these particles would always separate if a sufficiently strong flame was applied, and it would be impossible to expel the red colour afterwards. I dare not, however, advance this conjecture, though it is grounded on some experiments as a matter of certainty."

Cronstedt observes, that manganese communicates a colour both to glasses and saline solutions. Borax, which has dissolved it, becomes transparent, and assumes a reddish brown or hyacinthine colour; the microcosmic salt becomes transparent, of a crimson colour, and moulders in the air. In compositions for glass it becomes violet with the fixed alkali; but if a great quantity of manganese be added, the glass is in thick lumps and looks black; by scorification with lead the glass obtains a reddish brown colour. Manganese deflagrates with nitre; and the residuum, when thus deflagrated, communicates a deep-red colour to its lixivium. The calx, when reckoned to be light, weighs as much as an iron ore of the same texture. It ferments with vitreous compositions, and still more when melted with the microcosmic salt. The colours communicated by manganese to glasses are easily destroyed by the calx of tin or arsenic, and likewise vanish of themselves in the air.

According to Dr Brunnich, manganese, when melted with nitre, assumes a green colour. Tin unites very readily with manganese; but zinc not without great difficulty, perhaps on account of its volatility and inflammable nature. White arsenic adheres to it, and, by means of the phlogiston, reduces it to a metallic form. By simple calcination a blackish powder is produced; but if the ignition be continued for twelve days, it acquires a dark-green colour; producing also, sometimes, one of a white or reddish colour. All these various calces, by means of a sufficient degree of heat in a common crucible, run into a yellowish-red glass, which is pellucid, unless from too great thickness.

MANGE, in dogs. See *Diseases of Dogs*.

MANGE, in farriery. See there, § xxiii.

MANGERT (Dom Thomas), a Benedictine of the congregation of St Vanne and St Hidulphe, whose knowledge was an ornament to his order. It gained him also the titles of antiquarian, librarian, and counsellor, to Charles duke of Lorraine. He was preparing a very considerable work when he died, A. D. 1763, before he had put his last hand to his book, which was published by Abbé Jacquin. This production appeared in 1763, in folio, with this title: *Introduction à la science des Medailles, pour servir à la connoissance des Dieux, de la Religion, des Sciences, des Arts, et de tout ce qui appartient à l'Histoire ancienne, avec les preuves tirées des Medailles*. The elementary treatises on the numismatic science were not sufficiently extensive, and the particular dissertations were by far too tedious and prolix. This learned Benedictine has collected into a single volume all the principles contained in the former, and all the ideas of any consequence

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which are to be found scattered through the latter. His work may serve as a supplement to Montfaucon's *Antiquity explained*. From Mangeart we likewise have a volume of sermons; and a treatise on Purgatory, Nancy, 1739, 2 vols 12mo.

MANGEL-WURZEL. See BETA; and AGRICULTURE, n° 52.

MANGER, is a raised trough under the rack in the stall, made for receiving the grain or corn that a horse eats.

MANGER, a small apartment, extending athwart the lower-deck of a ship of war, immediately within the hause-holes, and fenced on the after-part by a partition, which separates it from the other part of the deck behind it. This partition serves as a fence to interrupt the passage of the water, which occasionally gushes in at the hause-holes, or falls from the wet cable whilst it is heaved in by the capstern. The water, thus prevented from running aft, is immediately returned into the sea by several small channels, called *scuppers*, cut through the ship's side within the manger. The manger is therefore particularly useful in giving a contrary direction to the water that enters at the hause-holes, which would otherwise run aft in great streams upon the lower-deck, and render it extremely wet and uncomfortable, particularly in tempestuous weather, to the men who mess and sleep in different parts thereof.

MANGENOT (Lewis), a canon of the temple at Paris, where he was born A. D. 1694, and died in 1768 at the age of 74. He was a social poet, and an amiable man. But although lively and agreeable in his conversation, his character leaned somewhat towards cynical misanthropy. Of this we may judge from the following verses, written on a little parlour which he had erected in a garden dependent on his benefice:

*Sans inquiétude, sans peine,
Je jouis dans ces lieux du destin le plus beau;
Les Dieux m'ont accordé l'Âme de Diogene;
Et mes foibles talens m'ont valu son tonneau.*

His Poems were published at Amsterdam in 1776. This collection contains two eclogues full of nature, simplicity, and elegance; fables, some of which are well composed; tales, which are by far too licentious; moral reflections; sentences; madrigals, &c. &c.

MANGET (John-James), an eminent physician, born at Geneva in 1652. The elector of Brandenburg made him his first physician in 1699; in which post he continued till his death, which happened at Geneva in 1742. He wrote many works; the most known of which are, 1. A collection of several Pharmacopœias, in folio. 2. *Bibliotheca pharmaceutico-medica*. 3. *Bibliotheca anatomica*. 4. *Bibliotheca chemica*. 5. *Bibliotheca chirurgica*. 6. A *bibliotheca* of all the authors who have written on medicine, in 4 vols folio. All these works are in Latin. Daniel le Clerc, the author of a History of Physic, assisted him in writing them.

MANGIFERA, the MANGO-TREE, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is pentapetalous; the plum kidney-shaped. There is but one species, a native of many parts of the East Indies, whence it has been transplanted to Brazil and other warm parts of America. It

grows to a large size; the wood is brittle, the bark rough when old; the leaves are seven or eight inches long, and more than two inches broad. The flowers are produced in loose panicles at the ends of the branches, and are succeeded by large oblong kidney-shaped plums. This fruit, when fully ripe, is greatly esteemed in the countries where it grows; but in Europe we have only the unripe fruit brought over in pickle. All attempts to propagate the plant have hitherto proved ineffectual; and Mr Miller is of opinion that the stones will not vegetate unless they are planted soon after they are ripe. He thinks therefore that the young plants ought to be brought over in boxes of earth; after which they may be kept in the tan-bed of the stove.

MANGOSTAN, or MANGOSTEEN. See GARCINIA.

MANGROVE. See RHIZOPHORA.

MANHEIM, a town of Germany, in the Lower Palatinate, with a very strong citadel, and a palace, where the elector Palatine often resides. It is seated at the confluence of the rivers Neckar and Rhine, in E. Long. 8. 33. N. Lat. 49. 25.

MANHOOD, that stage of life which succeeds puberty or adolescence. See MAN, n° 23.

MANIA, or MADNESS. See MEDICINE-Index.

MANICHEES, or MANICHEANS (*Manichæi*), a sect of ancient heretics, who asserted two principles; so called from their author *Manes* or *Manichæus*, a Persian by nation, and educated among the magi, being himself one of that number before he embraced Christianity.

This heresy had its first rise about the year 277, and spread itself principally in Arabia, Egypt, and Africa. St Epiphanius, who treats of it at large, observes, that the true name of this heresiarch was Curbicus; and that he changed it for *Manes*, which in the Persian or Babylonish language signifies *wisdom*. A rich widow, whose servant he had been, dying without issue, left him store of wealth; after which he assumed the title of the *apostle* or *envoy of Jesus Christ*.

Manes was not contented with the quality of apostle of Jesus Christ, but he also assumed that of the Paraclete, whom Christ had promised to send: which Augustin explains, by saying, that Manes endeavoured to persuade men, that the Holy Ghost did personally dwell in him with full authority. He left several disciples, and among others Addas, Thomas, and Hermas. These he sent in his lifetime into several provinces to preach his doctrine. Manes, having undertaken to cure the king of Persia's son, and not succeeding, was put in prison upon the young prince's death, whence he made his escape; but he was apprehended soon after, and flayed alive.

However, the oriental writers, cited by D'Herbelot and Hyde, tell us, that Manes, after having been protected in a singular manner by Hormizdas, who succeeded Sapor in the Persian throne, but who was not able to defend him, at length, against the united hatred of the Christians, the Magi, the Jews, and the Pagans, was shut up in a strong castle, to serve him as a refuge against those who persecuted him on account of his doctrine. They add, that after the death of Hormizdas, Varanes I. his successor, first protected Manes, but afterwards gave him up to the fury of the Magi, whose resentment against him was due to his having

Manichees having adopted the Sadducean principles, as some say: while others attribute it to his having mingled the tenets of the Magi with the doctrines of Christianity. However, it is certain that the Manicheans celebrated the day of their master's death. It has been a subject of much controversy whether Manes was an impostor. The learned Dr Lardner has examined the arguments on both sides; and though he does not choose to deny that he was an impostor, he does not discern evident proofs of it. He acknowledges, that he was an arrogant philosopher and a great schemist; but whether he was an impostor, he cannot certainly say. He was much too fond of philosophical notions, which he endeavoured to bring into religion, for which he is to be blamed: nevertheless, he observes, that every bold dogmatist is not an impostor.

The doctrine of Manes was a motley mixture of the tenets of Christianity with the ancient philosophy of the Persians, in which he had been instructed during his youth. He combined these two systems, and applied and accommodated to Jesus Christ the characters and actions which the Persians attributed to the god Mithras.

He established two principles, viz. a good and an evil one: the first, a most pure and subtle matter, which he called *light*, did nothing but good; and the second a gross and corrupt substance, which he called *darkness*, nothing but evil. This philosophy is very ancient; and Plutarch treats of it at large in his *Isis and Osiris*.

Our souls, according to Manes, were made by the good principle, and our bodies by the evil one; those two principles being, according to him, coeternal, and independent of each other. Each of these is subject to the dominion of a superintendent being, whose existence is from all eternity. The being who presides over the *light* is called *God*; he that rules the land of *darkness* bears the title of *hyle* or *demon*. The ruler of the *light* is supremely happy, and in consequence thereof benevolent and good: the prince of *darkness* is unhappy in himself, and desirous of rendering others partakers of his misery, and is evil and malignant. These two beings have produced an immense multitude of creatures, resembling themselves, and distributed them through their respective provinces. After a contest between the ruler of *light* and the prince of *darkness*, in which the latter was defeated, this prince of *darkness* produced the first parents of the human race. The beings engendered from this original stock, consist of a body formed out of the corrupt matter of the kingdom of darkness, and of two souls; one of which is sensitive and lustful, and owes its existence to the evil principle; the other rational and immortal, a particle of that divine light which had been carried away in the contest by the army of darkness, and immersed into the mass of malignant matter. The earth was created by God out of this corrupt mass of matter, in order to be a dwelling for the human race, that their captive souls might by degrees be delivered from their corporeal prisons, and the celestial elements extended from the gross substance in which they were involved. With this view God produced two beings from his own substance, viz. Christ and the Holy Ghost: for the Manicheans held a consubstantial Trinity. Christ, or the glorious intelligence, called by the Persians

Mithras, subsisting in and by himself, and residing in Manichees. the sun, appeared in due time among the Jews, clothed with the shadowy form of a human body, to disengage the rational soul from the corrupt body, and to conquer the violence of malignant matter. The Jews, incited by the prince of darkness, put him to an ignominious death, which he suffered not in reality, but only in appearance, and according to the opinion of men. When the purposes of Christ were accomplished, he returned to his throne in the sun, appointing apostles to propagate his religion, and leaving his followers the promise of the Paraclete or Comforter, who is Manes the Persian. Those souls who believe Jesus Christ to be the son of God, renounce the worship of the god of the Jews, who is the prince of darkness, and obey the laws delivered by Christ, and illustrated by Manes the comforter, are gradually purified from the contagion of matter; and their purification being completed, after having passed through two states of trial, by water and fire, first in the moon and then in the sun, their bodies return to the original mass (for the Manicheans derided the resurrection of bodies), and their souls ascend to the regions of light. But the souls of those who have neglected the salutary work of purification, pass after death into the bodies of other animals or natures, where they remain till they have accomplished their probation. Some, however, more perverse and obstinate, are consigned to a severer course of trial, being delivered over for a time to the power of malignant aerial spirits, who torment them in various ways. After this, a fire shall break forth and consume the frame of the world; and the prince and powers of darkness shall return to their primitive seats of anguish and misery, in which they shall dwell forever. These mansions shall be surrounded by an invincible guard, to prevent their ever renewing a war in the regions of light.

Manes borrowed many things from the ancient Gnostics; on which account many authors consider the Manicheans as a branch of the Gnostic.

In truth, the Manichean doctrine was a system of philosophy rather than of religion. They made use of amulets, in imitation of the Basilidians; and are said to have made profession of astronomy and astrology. They denied that Jesus Christ, who was only God, assumed a true human body, and maintained it was only imaginary: and therefore they denied his incarnation, death, &c. They pretended that the law of Moses did not come from God, or the good principle, but from the evil one; and that for this reason it was abrogated. They rejected almost all the sacred books in which Christians look for the sublime truths of their holy religion. They affirmed, that the Old Testament was not the work of God, but of the prince of darkness, who was substituted by the Jews in the place of the true God. They abstained entirely from eating the flesh of any animal; following herein the doctrine of the ancient Pythagoreans: they also condemned marriage. The rest of their errors may be seen in St Epiphanius and St Augustin; which last, having been of their sect, may be presumed to have been thoroughly acquainted with them.

Tho' the Manichees professed to receive the books of the New Testament, yet in effect they only took so much of them as suited with their own opinions.

They

Manichees. They first formed to themselves a certain idea or scheme of Christianity; and to this adjusted the writings of the apostles, pretending that whatever was inconsistent with this had been foisted into the New Testament by later writers, who were half Jews. On the other hand, they made fables and apocryphal books pass for apostolical writings; and even are suspected to have forged several others, the better to maintain their errors. St Epiphanius gives a catalogue of several pieces published by Manes, and adds extracts out of some of them. These are the Mysteries, Chapters, Gospel, and Treasury.

The rule of life and manners which Manes prescribed to his followers was most extravagantly rigorous and severe. However, he divided his disciples into two classes; one of which comprehended the perfect Christians, under the name of *the elect*; and the other, the imperfect and feeble, under the title of *auditors* or *hearers*. The elect were obliged to a rigorous and entire abstinence from flesh, eggs, milk, fish, wine, all intoxicating drink, wedlock, and all amorous gratifications; and to live in a state of the severest penury, nourishing their emaciated bodies with bread, herb, pulse, and melons, and depriving themselves of all the comforts that arise from the moderate indulgence of natural passions, and also from a variety of innocent and agreeable pursuits. The auditors were allowed to possess houses, lands, and wealth, to feed on flesh, to enter into the bonds of conjugal tenderness; but this liberty was granted them with many limitations, and under the strictest conditions of moderation and temperance. The general assembly of the Manicheans was headed by a president, who represented Jesus Christ. There were joined to him 12 rulers or masters, who were designed to represent the 12 apostles, and these were followed by 72 bishops, the images of the 72 disciples of our Lord. These bishops had presbyters or deacons under them, and all the members of these religious orders were chosen out of the class of the elect. Their worship was simple and plain; and consisted of prayers, reading the scriptures, and hearing public discourses, at which both the auditors and elect were allowed to be present. They also observed the Christian appointment of baptism and the eucharist. They kept the Lord's day, observing it as a fast; and they likewise kept Easter and Pentecost.

Towards the 4th century, the Manicheans concealed themselves under various names, which they successively adopted, and changed in proportion as they were discovered by them. Thus they assumed the names of Encratites, Apotactics, Saccophori, Hydroparastates, Solitaries, and several others, under which they lay concealed for a certain time, but could not however long escape the vigilance of their enemies. About the close of the 6th century, this sect gained a very considerable influence, particularly among the Persians.

Toward the middle of the 12th century, the sect of Manichees took a new face, on occasion of one Constantine, an Armenian, and an adherer to it; who took upon him to suppress the reading of all other books besides the Evangelists and the Epistles of St Paul, which he explained in such a manner as to make them contain a new system of Manicheism. He entirely discarded all the writings of his predecessors;

rejecting the chimeras of the Valentinians, and their 30 æons; the fable of Manes, with regard to the origin of rain and other dreams; but still retained the impurities of Basilides. In this manner he reformed Manicheism, inasmuch that his followers made no scruple of anathematizing Scythian, Buddas, called also *Addas* and *Terebinth*, the contemporaries and disciples, as some say, and, according to others, the predecessors and masters of Manes, and even Manes himself, Constantine being now their great apostle. After he had seduced an infinite number of people, he was at last stoned by order of the emperor.

This sect prevailed in Bosnia and the adjacent provinces about the close of the 15th century; propagated their doctrines with confidence, and held their religious assemblies with impunity.

MANICORDON, or **MANICHORD**, a musical instrument in form of a spinet; the strings of which, like those of the clarichord, are covered with little pieces of cloth, to deaden as well as to soften their sound, whence it is also called the *dumb spinet*.

MANIFESTO; a public declaration made by a prince in writing, showing his intentions to begin a war or other enterprise, with the motives that induce him to it, and the reasons on which he founds his rights and pretensions.

MANIHOT, or **MANIOC**. See **JATROPHA**.

MANILA, **LUCONIA**, or *Luzon*, the name of the largest of the Philippine islands in the East Indies, subject to Spain. It had the name of *Luzon* from a custom that prevailed among the natives of beating or bruising their rice in wooden mortars, before they either boiled or baked it; *luzon*, in their language, signifying "a mortar."

As to situation, it is remarkably happy, lying between the eastern and western continents, and having China on the north, at the distance of about 60 leagues; the islands of Japan on the north-east, at the distance of about 250 leagues from the nearest of them; the ocean on the east; the other islands on the south; and on the west Malacca, Patana, Siam, Cambodia, Cochinchina, and other provinces of India, the nearest at the distance of 300 leagues.

The middle of this island is in the latitude 15° north; the east point in 13° 38', and the most northern point in 19°. The shape of it is said to resemble that of an arm bent; the whole length being about 160 Spanish leagues, the greatest breadth between 30 and 40, and the circumference about 350. As to the longitude, the charts differ, some making the middle of the island to lie 113° east from London, and others in 160°. The climate is hot and moist. One thing is held very extraordinary, that in stormy weather there is much lightning and rain, and that thunder is seldom heard till this is over. During the months of June, July, August, and part of September, the west and south winds blow, which they call *vendavales*, bringing such rains and storms, that the fields are all overflowed, and they are forced to have little boats to go from one place to another. From October till the middle of December, the north wind prevails; and from that time till May, the east and south-east; which winds are there called *breezes*. Thus there are two seasons in those seas, by the Portuguese called *monsoons*; whence our word *monsoons*, that is, the breezes half

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Manila. half the year, with a serene dry air; and the vendavales the other half, wet and stormy. It is further to be observed, that in this climate no vermin breed upon Europeans, though they wear dirty shirts, whereas it is otherwise with the Indians. The days here being always of an equal length, and the weather never cold, neither their clothes, nor the hour of dining, supping, doing business, studying, or praying, are ever changed; nor is cloth worn, but only against the rain.

The air here being, as has been observed, very hot and moist, is not wholesome; but is worse for young men that come from Europe than for the old. As for the natives, without using many precautions, they live very commonly to fourscore or 100. The soil is so rich, that rice grows even on the tops of the mountains without being watered; and this makes it so plentiful, that the Indians value gold so little as not to pick it up, though it lies almost every where under their feet.

Among the disadvantages of the island, besides frequent and terrible earthquakes, here are several burning mountains. The face of the island, however, is far from being disfigured by them, or by the consequences of their explosions.

The mountaineers, called *Tingiani*, have no particular place of abode, but always live under the shelter of trees, which serve them instead of houses, and furnish them with food; and when the fruit is eaten up, they remove where there is a fresh sort.

Here are 40 different sorts of palm-trees, the most excellent cocoas, wild cinnamon, wild nutmegs, and some say wild cloves also; ebony; sandal-wood; the best cassia, and in such plenty, that they feed their hogs with its fruit; all kinds of cattle, and prodigious quantities of gold, amber, and ambergrise.

There are several sorts of people in this island besides the Spaniards, as the Tagalians or Tagaleze, the Pintadoes or painted negroes, the Ilayas or Tinglianos, and the Negrellos. The Tagalians, who are thought to be Malaysians by descent, are a modest, tractable, and well disposed people. The Pintadoes, or painted negroes, are tall, straight, strong, active, and of an excellent disposition. The Tinglianos, whom some suppose to be descended from the Japanese, are very brave, yet very courteous and humane. They live entirely on the gifts of nature; and never sleep under any other shade than that of the trees or a cave. The Negrellos, who are held to be the Aborigines of the island, are barbarous and brutal to the last degree. When they kill a Spaniard, they make a cup of his skull and drink out of it.

This island is divided into several provinces, containing divers towns, the chief of which are Manila, Caceres, New-Segovia, Bondo, Passacao, Ibalon, Bulaw, Serfocon, or Bagatao, Lampon, Fernandina, Bolinao, Playahonda, Cavite, Mindora, Caleleya, and Balayan.

MANILA, the capital of an island of the same name in the East Indies, on the south-east side of the island, where a large river falls into the sea, and forms a noble bay 30 leagues in compass, to which the Spaniards have given the name of *Bahia*, because the river runs out of the great lake Bahi, which lies at the distance of six leagues behind it. In compass it is two miles,

in length one third of a mile; the shape irregular, being narrow at both ends, and wide in the middle. On the south it is washed by the sea, and on the north and east by the river; being also strongly fortified with walls, bastions, forts, and batteries.—Manila contains about 30,000 souls, who are a very motely race, distinguished by several strange names, and produced by the conjunction of Spaniards, Chinese, Malabars, Blacks, and others inhabiting the city and islands depending on it. Without the walls are large suburbs, particularly that inhabited by the Chinese merchants, called *Sangleys*. In proportion to the size of the place, the number of churches and religious houses is very great. Only small vessels can come up to Manila; but three leagues south of it is the town and port of Cavite, defended by the castle of St Philip, and capable of receiving the largest ships. Here stands the arsenal where the galleons are built, for which there are from 300 to 600 or 800 men constantly employed, who are relieved every month, and while upon duty are maintained at the king's expence. By an earthquake which happened here in 1645, a third part of the city of Manila was destroyed, and no less than 3000 people perished in the ruins.

In the war beforelast, Spain having entered into engagements with France, in consequence of the family-compact of the house of Bourbon, it was found expedient by Britain to declare war also against Spain. Whereupon a force was sent out from our East-India settlements, particularly Madras, for the conquest of the Philippine Islands, under General Draper and Admiral Cornish: who, after a siege of 12 days, took Manila on the 6th of October 1762 by storm; but, to save so fine a city from destruction, agreed to accept a ransom, amounting to a million sterling, a part of which, it is said, was never paid. The Spanish viceroy resides in this city, and lives like a sovereign prince. The government is said to be one of the best in the gift of the king of Spain. When the city was taken, as above, the archbishop, who is a kind of pope in this part of the world, was also viceroy. Five large ships, loaded with the riches of the East, as diamonds from Golconda, cinnamon from Ceylon, pepper from Sumatra and Java, cloves and nutmegs from the Moluccas and Banda islands, camphire from Borneo, benjamin and ivory from Cambodia, silks, tea, and china-ware from China, &c. sail yearly from hence to Acapulco in Mexico, and return freighted with silver, making 400 per cent. profit.

The city of Manila is governed by two alcaides: the rest of the cities and great towns have each an alcaide; and in every village there is a corregidore. Appeals from their sentences are made to the royal court at Manila, in which there are four judges, and a fiscal or attorney-general; each of these judges has a salary of 3300 pieces of eight per annum. The viceroy is president; and in that quality has an income of 4000 pieces of eight, but he has no vote; yet if the judges are equally divided, the president names a doctor of the civil law, who, in virtue of his appointment, has a decisive voice. The attorney-general, in right of his office, is protector of the Chinese, in consideration of which he receives 600 pieces of eight every year. As for the Indians that are in subjection, they pay tribute in the following proportions: Young men from

Manila.

Manilius 18, and from thence, if they continue single, to the age of 60, pay five rials of plate by way of capitation; as single women likewise do from 24 to 50: married men pay ten rials. It is computed, that there are within the compass of this government 250,000 Indians, subject to his Catholic majesty, of whom two-fifths hold immediately from the king, and the rest from lords or proprietors, who pay two rials each for the maintenance of the forces, and the like sum for the parish-priest. The royal revenue is computed at about half a million of pieces of eight, exclusive of casualties. In regard to the military establishment, the garrison of Manila consists of about 800 or 1000 men, and there are about 3000 more in the Philippines. The viceroy is by his office captain-general, with a salary of about 4000 pieces of eight.

MANILIUS (Marcus), a Latin poet, whose poem had the ill luck to lie buried in some German libraries, and was not heard of in the world until Poggius, about two centuries ago, published him from some old manuscripts he found there. There is no account to be found of him but what can be drawn from his poem, which is called *Astronomicon*; and contains a system of the ancient astronomy and astrology, together with the philosophy of the Stoics. It consists of five books; though there was a sixth, which has not been recovered. From the style, and no mention of the author being found in ancient writers, it is probable he died young. It is collected, however, that he was a Roman of illustrious extraction, and lived under the reign of Augustus, whom he invokes, though not by name, yet by circumstances and character that suit no other emperor. The best editions of Manilius are, that of Joseph Scaliger in 1600, and that of Bently at London in 1738.

MANILLE, in commerce, a large brass ring in the form of a bracelet, either plain or engraven, flat or round.

Manilles are the principal commodities which the Europeans carry to the coast of Africa, and exchange with the natives for slaves. These people wear them as ornaments on the small of the leg, and on the thick part of the arm above the elbow. The great men wear manilles of gold and silver; but these are made in the country by the natives themselves.

MANIOC, or **MANIHOT**. See **JATROPHA**.

MANIPULUS, **MANIPULE**, among the Romans, was a little body of infantry, which in the time of Romulus consisted of 100 men; and in the time of the consuls, and first Cæsars, of 200.

The word properly signifies "a handful;" and, according to some authors, was first given to the handful of hay which they bore at the end of a pole, to distinguish themselves by, before the custom was introduced of bearing an eagle for their ensign; and hence also the phrase, *a handful of men*. But Vegetius, Modestus, and Varro, gave other etymologies of the word: the last derives it from *manus*, a little body of men following the same standard. According to the former, this corps was called *manipulus*, because they fought hand in hand or all together: *Contubernium autem manipulus vocabatur ab eo, quod conjunctis manus pariter dimicabant*.

Each manipule had two centurions, or captains, N^o 194.

called *manipularii*, to command it; one whereof was lieutenant to the other. Each cohort was divided into three manipules, and each manipule into two centuries.

Aulus Gellius quotes an old author, one Cincius, who lived in the time of Hannibal (whose prisoner he was), and who, writing on the art of war, observes, that then each legion consisted of 60 centuries, of 30 manipules, and of ten cohorts. And again, Varro and Vegetius mention it as the least division in the army, only consisting of the tenth part of a century; and Spartian adds, that it contained no more than ten men. This shows that the manipulus was not always the same thing.

MANIPULUS is also an ecclesiastical ornament, worn by the priests, deacons, and subdeacons in the Romish church. It consists of a little fillet in form of a stole, three or four inches broad, and made of the same stuff with the chasuble; signifying and representing an handkerchief which the priests in the primitive church wore on the arm to wipe off the tears they were continually shedding for the sins of the people. There still remains a mark of this usage in a prayer rehearsed by those who wear it; *Merear, Domine, portare manipulum fletus & doloris*.—The Greeks and Maronites wear two manipules, one on each arm.

MANIPULUS, among physicians, is used to signify a handful of herbs or leaves, or so much as a man can grasp in his hand at once; which quantity is frequently denoted by the abbreviature, M, or m.

MANIS, the **SCALY LIZARD**, in zoology; a genus of quadrupeds belonging to the order of bruta, the characters of which are these: They have no foreteeth either in the upper or under jaw; the tongue is long and cylindrical; the snout is long and narrow; and the body is covered with hard scales. There are two species: 1. The pentadactyla, or short-tailed manis, with five toes on each foot. The head is smaller than the neck; the eyes are very small; the length of the body, including the tail, is from six to eight feet. The whole body is covered with hard scales, excepting the under-part of the head and neck, the breast, the belly, and the internal side of each leg. Betwixt the scales of this animal there are some hairs like the bristles of a hog, brownish at the points. The scales are of a reddish colour, very hard, convex above, and concave below. All the parts which want scales are naked. The scales are unconnected; and the animal can raise or lower them at pleasure, like the quills of the porcupine. When irritated, he erects his scales, and rolls himself up like a hedge-hog. In this situation, neither the lion, tiger, nor any other animal can hurt him. It is said to destroy the elephant by twisting itself round his trunk, and compressing that tender organ with its hard scales. It feeds on lizards and insects; turns up the ground with its nose; walks with its claws bent under its feet; grows very fat; and is esteemed delicate eating; makes no other noise than a kind of snorting. It is a mild inoffensive creature, is slow of motion, and has no other method of escaping the pursuit of man, but by concealing himself in crannies of rocks, and in holes which they dig in the ground, and where they likewise bring forth their young. It is a native of the East Indies, and is very rare. Mr Pennant conjectures that it may be a native

Plate
CCLXXX.

of

Manley,
Manlius

of Guinea; the *quogeli* of the Negroes, which, Des Marchais says, grows to the length of eight feet, of which the tail is four. It lives in woods and marshy places; feeds on ants, which it takes by laying its long tongue across their paths, which is covered with a viscid saliva, so that the insects which attempt to pass over it cannot extricate themselves.

2. The tetradactyla, or long-tailed *manis*, with four toes on each foot. This species is very similar to the former; only the tail of it is much longer in proportion to the body; and such parts as want scales, instead of being naked, are covered with a soft hair. It inhabits Guinea, and is also found in the East Indies.

MANLEY (Mrs), the celebrated writer of the *Atalantis*, was the daughter of Sir Roger Manley, the reputed author of the first volume of the *Turkish Spy*. She lost her parents very early; and after having been deluded into a false marriage by her guardian, who was her cousin, and afterwards deserted her, she was patronized by the duchess of Cleveland, mistress of Charles II. But the duchess, being a woman of a very fickle temper, grew tired of Mrs Manley in six months time; and discharged her upon a pretence, whether groundless or not is uncertain, that she intrigued with her son. After this she wrote her first tragedy, called *Royal Mischief*, which was acted with great applause in 1696; and her apartment being frequented by men of wit and gaiety, she soon engaged in amours, and was taken into keeping. Her pen now grew as licentious as her conduct: for, in her retired hours, she wrote four volumes, called *Memoirs of the New Atalantis*; in which she was not only very free in her wanton tales of love-adventures, but satirized the characters of many distinguished personages, especially those who had a principal concern in the Revolution. A prosecution was commenced against her for this work; but whether those in power were ashamed to bring a woman to trial for a few amorous trifles, or whether the laws could not reach her disguised satire, she was discharged; and a total change of the ministry ensuing, Mrs Manley lived in high reputation and gaiety, amusing herself with the conversation of wits, and writing plays, poems, and letters. She died in 1724.

MANLIUS (Capitolinus), the renowned Roman consul and general, who saved the capitol when it was attacked by the Gauls in the night: he was alarmed by the cries of geese, which were ever after held sacred. But being afterwards accused of aspiring at the sovereignty, he was thrown from the Tarpeian rock. See GAUL and ROME.

MANLIUS (Torquatus), a celebrated consul and Roman captain; had great wit, but a difficulty in expressing himself, which induced Manlius Imperiosus, his father, to keep him almost by force in the country. Pompey, tribune of the people, enraged at this instance of severity, formed a design of accusing Manlius the father before the judges; but Torquatus being informed of it, went to that tribune, and, with a poniard in his hand, made him swear that he would not proceed in that accusation against him to whom he owed his life. At length Torquatus was made military tribune, and killed a soldier of the Gauls in single

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combat, from whom he took a gold chain that he wore about his neck. From this action he obtained the name of *Torquatus*. He was consul in the war against the Latins; when he ordered his own son to be beheaded, for fighting contrary to his orders, though he had gained the victory. He conquered the enemies of the republic, and was several times made consul; but at last refused the consulship, saying, That it was no more possible for him to bear with the vices of the people, than it was for the people to bear with his severity.

MANNA, in the materia medica, the juice of certain trees of the ash-kind*, either naturally concreted on the plants, or exsiccated and purified by art. There are several sorts of manna in the shops. The larger pieces, called *flake manna*, are usually preferred; though the smaller grains are equally good, provided they are white, or of a pale yellow colour; very light, of a sweet, not unpleasant taste, and free from any visible impurities. Some people injudiciously prefer the fat honey-like manna to the foregoing; this has either been exposed to a moist air, or damaged by sea or other water. This kind of manna is said to be sometimes counterfeited by a composition of sugar and honey mixed with a little scammony; there is also a factitious manna, which is white and dry, said to be composed of sugar, manna, and some purgative ingredient, boiled to a proper consistence. This may be distinguished by its weight, solidity, untransparent whiteness, and by its taste, which is different from that of manna.

Manna is a mild, agreeable laxative; and may be given with safety to children and pregnant women: nevertheless, in some particular constitutions, it acts very unkindly, producing flatulencies and distensions of the viscera: these inconveniences may be prevented by the addition of any grateful warm aromatic. It operates so weakly, that it does not produce the full effect of a cathartic, unless taken in large doses; and hence it is rarely given in this intention by itself. It may be commodiously dissolved in the purging mineral waters, or joined to the cathartic salts, senna, rhubarb, or the like. Geoffroy recommends acuating it with a few grains of emetic tartar: by this management, he says, bilious serum will be plentifully evacuated, without any nausea, gripes, or other inconvenience. It is remarkable, that the efficacy of this drug is greatly promoted (if the account of Vallisnieri is to be relied on) by a substance which is itself very slow of operation, viz. casia. See CASIA.

MANNA, is also a Scripture-term, signifying a miraculous kind of food which fell from heaven for the support of the Israelites in their passage through the wilderness, being in form of coriander-seeds, its colour like that of bdellium, and its taste like honey.

The Scripture gives to manna the name of the *bread of heaven*, and the *food of angels*, Psal. lxxviii. 25. whether it would insinuate to us, that the angels sent and prepared this food, or that angels themselves, if they had need of any food, could not have any that was more agreeable than manna was. The author of the Book of Wisdom says, xvi. 20. 21. that manna so accommodated itself to every one's taste, that every one found it pleasing to him; and that it included every thing that was agreeable to the palate and fit for good

3 Y

nourish-

Manna.

*See MANNA-TREE below.

Manna

nourishment; which expression some have taken in the literal sense, though others understand them figuratively.

The critics are divided about the original of the word *manna*. Some think that *man* is put instead of the Hebrew word *mab*, which signifies "What is this?" and that the Hebrews, then first seeing that new food which God had sent them, cried to one another, *man-hu*, instead of *mab-hu*, "What is this?" Others maintain, that the Hebrews very well knew before what manna was; and that, seeing it in great abundance about their camp, they said one to another, *Man-hu*, "This is manna." Mr Saumaise and some other moderns are of this last opinion. They imagine, that the manna which God sent the Israelites was nothing else but that fat and thick dew which still falls in Arabia, which presently condensed, and served for food to the people; that this is the same thing as the wild honey, mentioned Matt. iii. 4. wherewith John the Baptist was fed; and that the miracle of Moses did not consist in the production of any new substance, but in the exact and uniform manner in which the manna was dispensed by Providence for the maintenance of such a great multitude.

On the contrary, the Hebrews and Orientals believe, that the fall of the manna was wholly miraculous. The Arabians call it the *sugar-plums of the Almighty*; and the Jews are so jealous of this miracle, that they pronounce a curse against all such as presume to deny the interposition of a miraculous power.

Our translation, and some others, make Moses fall into a plain contradiction in relating this story of the manna, which they render thus: "And when the children of Israel saw it, they said one to another, It is manna; for they wist not what it was." Exodus xvi. 15. Whereas the Septuagint, and several authors both ancient and modern, have translated the text according to the original, "The Israelites seeing this, said one to another, What is this? for they knew not what it was." For we must observe, that the word by which they asked, *what this is?* was in their language *man*, which signifies likewise meat ready provided; and therefore it was always afterwards called *man* or *manna*.

Whether this manna had those extraordinary qualities in it or no, which some imagine, it must be allowed to be truly miraculous, upon the following accounts. 1. That it fell but six days in the week. 2. That it fell in such a prodigious quantity, as sustained almost three millions of souls. 3. That there fell a double quantity every Friday, to serve them for the next day, which was their Sabbath. 4. That what was gathered on the first five days stunk and bred worms if kept above one day: but that which was gathered on Friday kept sweet for two days. And, lastly, That it continued falling while the Israelites abode in the wilderness, but ceased as soon as they came out of it and had got corn to eat in the land of Canaan.

† See *Fraxinus*.

MANNA-Tree, is a species of the ash †, and a native of Calabria in Italy. The shoots of this tree are much shorter, and the joints closer together, than those of the common ash; the small leaves are shorter, and deeper sawed on their edges, and are of a lighter

green. The flowers come out from the side of the branches, which are of a purple colour, and appear in the spring before the leaves come out. This tree is of humble growth, seldom rising more than 15 or 16 feet high in this country.

A great quantity of fine manna is gathered at Carini in Sicily, oozing from a kind of ash-tree with a bark similar to that of the ebony, and a leaf somewhat like the acacia. M. de Non*, who gives an account of this manna, says, that it is produced from young trees about seven or eight years old when they are only about eight feet high. Incisions are then made horizontally in the bark, and from these the manna flows. The incisions are made from the earth to the top of the tree, and are repeated every two days from the end of July till the circulation is stopped in the course of the year, or till the manna becomes worse in quality. It exudes first as a white frothy liquor extremely light, pleasant to the taste, and of an agreeable flavour, which is coagulated by the heat of the sun, and assumes an appearance somewhat resembling stalactites. This is the best kind, and by the people of that country is called *lachrymatory* or *cane manna*. The inferior kind appears first in the form of a glutinous and higher coloured liquor, which is received on the leaves of the Indian fig, which are placed for that purpose at the foot of the tree. This also coagulates by the heat of the sun; though it is more heavy, purgative, and of much less value, than the former. It is called *fat manna*: In this part only resides the faint and disagreeable flavour observable in manna; for the cane manna is of an agreeable flavour, and of an excellent stomachic. It is got off from the bark of the tree by bending and shaking it. In rainy seasons, they must gather the manna every day, which both lessens the quantity and renders it of inferior quality. When the stem of the tree is entirely covered with incisions, they cut it down close to the ground; after which it pushes out new tufts of wood, one or two stems of which are preserved, and at a proper age produce manna as before. The tree itself is propagated by seed, and afterwards transplanting it. The wood is hard and heavy, of a bitter taste, and recommended in the dropsy. It thrives only in hot climates, and requires to be exposed to the north winds in order to make it productive; but M. de Non is of opinion, that it might be propagated, and would produce manna in Provence in France. The Sicilian manna is dearer and more esteemed than that of Calabria, though the latter is more generally known and cultivated. The tree does not grow in any other part of the island excepting about Carini, where it is a native.

MANNER, in painting, a habitude that a man acquires in the three principal parts of painting, the management of colours, lights, and shadows; which is either good or bad according as the painter has practised more or less after the truth, with judgment and study. But the best painter is he who has no manner at all. The good or bad choice he makes is called *goute*.

MANNERS, the plural noun, has various significations; as, the general way of life, the morals, or the habits, of any person or people; also ceremonious behaviour, or studied civility. See the next article.

Good

Manna
||
Manners.

Travels in
Sicily.

Good-Manners.

Good-MANNERS, according to Swift, is the art of making those people easy with whom we converse.

Whoever makes the fewest persons uneasy, is the best bred in the company.

As the best law is founded upon reason, so are the best manners. And as some lawyers have introduced unreasonable things into common law; so likewise many teachers have introduced absurd things into common good-manners.

One principal point of this art is to suit our behaviour to the three several degrees of men; our superiors, our equals, and those below us.

For instance, to press either of the two former to eat or drink is a breach of manners; but a tradesman or a farmer must be thus treated, or else it will be difficult to persuade them that they are welcome.

Pride, ill-nature, and want of sense, are the three great sources of ill-manners: without some one of these defects, no man will behave himself ill for want of experience; or of what, in the language of fools, is called *knowing the world*.

"I defy (proceeds our author) any one to assign an incident wherein reason will not direct us what we are to say or to do in company, if we are not misled by pride or ill-nature. Therefore, I insist that good sense is the principal foundation of good manners; but because the former is a gift which very few among mankind are possessed of, therefore all the civilized nations of the world have agreed upon fixing some rules for common behaviour, best suited to their general customs, or fancies, as a kind of artificial good-sense to supply the defects of reason. Without which, the gentlemanly part of dunces would be perpetually at cuffs, as they seldom fail when they happen to be drunk, or engaged in squabbles about women or play. And, God be thanked, there hardly happeneth a duel in a year, which may not be imputed to one of those three motives. Upon which account, I should be exceedingly sorry to find the legislature make any new laws against the practice of duelling; because the methods are easy, and many, for a wise man to avoid a quarrel with honour, or engage in it with innocence. And I can discover no political evil, in suffering bullies, sharpers, and rakes, to rid the world of each other by a method of their own, where the law hath not been able to find an expedient.

"As the common forms of good-manners were intended for regulating the conduct of those who have weak understandings; so they have been corrupted by the persons for whose use they were contrived. For these people have fallen into a needless and endless way of multiplying ceremonies, which have been extremely troublesome to those who practise them, and insupportable to every body else; insomuch that wise men are often more uneasy at the over-civility of these refiners, than they could possibly be in the conversations of peasants or mechanics.

"The impertinencies of this ceremonial behaviour are nowhere better seen than at those tables where ladies preside, who value themselves upon account of their good-breeding; where a man must reckon upon passing an hour without doing any one thing he hath a mind to, unless he will be so hardy as to break through all the settled decorum of the family. She determines what he loveth best, and how much he shall eat; and

Good-Manners.

if the master of the house happeneth to be of the same disposition, he proceedeth in the same tyrannical manner to prescribe in the drinking part: at the same time you are under the necessity of answering a thousand apologies for your entertainment. And although a good deal of this humour is pretty well worn off among many people of the best fashion, yet too much of it still remaineth, especially in the country; where an honest gentleman assured me, that having been kept four days against his will at a friend's house, with all the circumstances of hiding his boots, locking up the stable, and other contrivances of the like nature, he could not remember, from the moment he came into the house to the moment he left it, any one thing wherein his inclination was not directly contradicted; as if the whole family had entered into a combination to torment him.

"But, besides all this, it would be endless to recount the many foolish and ridiculous accidents I have observed among these unfortunate proselytes to ceremony. I have seen a duchess fairly knocked down by the precipitancy of an officious coxcomb running to save her the trouble of opening a door. I remember, upon a birth-day at court, a great lady was rendered utterly disconsolate, by a dish of sauce let fall by a page directly upon her head-dress and brocade, while she gave a sudden turn to her elbow upon some point of ceremony with the person who sat next her. Monsieur Buys, the Dutch envoy, whose politics and manners were much of a size, brought a son with him about 13 years old to a great table at court. The boy and his father, whatever they put on their plates, they first offered round in order, to every person in the company; so that we could not get a minute's quiet during the whole dinner. At last their two plates happened to encounter, and with so much violence, that, being china, they broke in 20 pieces, and stained half the company with wet sweatmeats and cream.

"There is a pedantry in manners as in all arts and sciences, and sometimes in trades. Pedantry is properly the over-rating any kind of knowledge we pretend to. And if that kind of knowledge be a trifle in itself, the pedantry is the greater. For which reason I look upon fiddlers, dancing-masters, heralds, masters of the ceremony, &c. to be greater pedants than Lipsius, or the elder Scaliger. With these kind of pedants, the court, while I knew it, was always plentifully stocked: I mean from the gentleman-usher (at least) inclusive, downward to the gentleman porter; who are, generally speaking, the most insignificant race of people that this island can afford, and with the smallest tincture of good-manners, which is the only trade they profess. For being wholly illiterate, conversing chiefly with each other, they reduce the whole system of breeding within the forms and circles of their several offices: and as they are below the notice of ministers, they live and die in court under all revolutions, with great obsequiousness to those who are in any degree of credit or favour, and with rudeness and insolence to every body else. From whence I have long concluded, that good-manners are not a plant of the court-growth: for if they were, those people who have understandings directly of a level for such acquirements, and who have served such long apprenticeships to nothing else, would certainly have picked them up. For as to the

Good-
Manners.

great officers who attend the prince's person or councils, or preside in his family, they are a transient body, who have no better a title to good-manners than their neighbours, nor will probably have recourse to gentlemen-ushers for instruction. So that I know little to be learned at court on this head, except in the material circumstance of dress; wherein the authority of the maids of honour must indeed be allowed to be almost equal to that of a favourite actresses.

"I remember a passage my lord Bolinbroke told me: That going to receive prince Eugene of Savoy at his landing, in order to conduct him immediately to the queen, the prince said he was much concerned that he could not see her majesty that night: for Monsieur Hoffman (who was then by) had assured his highness, that he could not be admitted into her presence with a tied-up periwig; that his equipage was not arrived; and that he had endeavoured in vain to borrow a long one among all his valets and pages. My lord turned the matter to a jest, and brought the prince to her majesty: for which he was highly censured by the whole tribe of gentlemen-ushers; among whom Monsieur Hoffman, an old dull resident of the emperor's, had picked up this material point of ceremony; and which, I believe, was the best lesson he had learned in 25 years residence.

"I make a difference between *good-manners* and *good-breeding*; although, in order to vary my expression, I am sometimes forced to confound them. By the first, I only understand the art of remembering, and applying, certain settled forms of general behaviour. But *good-breeding* is of a much larger extent: for besides an uncommon degree of literature sufficient to qualify a gentleman for reading a play, or a political pamphlet, it taketh in a great compass of knowledge; no less than that of dancing, fighting, gaming, making the circle of Italy, riding the great horse, and speaking French; not to mention some other secondary or subaltern accomplishments, which are more easily acquired. So that the difference between good-breeding and good-manners lieth in this, That the former cannot be attained to by the best understandings without study and labour; whereas a tolerable degree of reason will instruct us in every part of good-manners without other assistance.

"I can think of nothing more useful upon this subject, than to point out some particulars wherein the very essentials of good-manners are concerned; the neglect or perverting of which doth very much disturb the good commerce of the world, by introducing a traffic of a mutual uneasiness in most companies.

"First, a necessary part of good-manners is a punctual observance of time at our own dwellings, or those of others, or at third places; whether upon matters of civility, business, or diversion; which rule, though it be a plain dictate of common reason, yet the greatest minister I ever knew, was the greatest trespasser against it; by which all his business doubled upon him, and placed him in a continual arrears. Upon which I often used to rally him as deficient in point of good-manners. I have known more than one ambassador, and secretary of state, with a very moderate portion of intellectuals, execute their office with great success and applause, by the mere force of exactness and regula-

city. If you duly observe time for the service of another, it doubles the obligation; if upon your own account, it would be manifest folly, as well as ingratitude, to neglect it; if both are concerned, to make your equal or inferior attend on you to his own disadvantage, is pride and injustice.

"Ignorance of forms cannot properly be styled *ill-manners*: because forms are subject to frequent changes; and consequently, being not founded upon reason, are beneath a wise man's regard. Besides, they vary in every country; and after a short period of time vary frequently in the same: so that a man who travelleth, must needs be at first a stranger to them in every court through which he passeth; and perhaps, at his return, as much a stranger in his own; and, after all, they are easier to be remembered or forgotten than faces or names.

"Indeed, among the many impertinencies that superficial young men bring with them from abroad, this bigotry of forms is one of the principal, and more predominant than the rest; who look upon them not only as if they were matters capable of admitting of choice, but even as points of importance; and therefore are zealous upon all occasions to introduce and propagate the new forms and fashions they have brought back with them: so that, usually speaking, the worst-bred person in the company is a young traveller just arrived from abroad."

MANNORY (Lewis), late advocate of the parliament of Paris, where he was born in 1696, and died in 1777. From him we have 18 vols 12mo of *Pleadings* and *Memoirs*. A great number of singular cases occur in this collection: and the author has the talent of rendering them more striking by the agreeable manner in which they are stated. He was Travenol's counsel in his process against Voltaire, and was very satirical against that poet. The latter took revenge by describing him as a mercenary babbler, who sold his pen and his abuse to the highest bidder.—Whatever may be the case, Mannory would certainly have been more esteemed both as an advocate and as a writer, if he had paid more attention to his style, and had been less prolix; if he had thought more deeply, and been more sparing of his pleasantry in causes where nothing was required but knowledge and sound reasoning. He published also a translation into French of Father Parée's funeral Oration on Louis XIV. and very judicious Observations on the Semiramis of Voltaire. In company Mannory was full of wit and spirit, but sometimes a little too cutting and severe.

MANOEUVRE, in a military sense, consists solely in distributing equal motion to every part of a body of troops, to enable the whole to form, or change their position, in the most expeditious and best method, to answer the purposes required of a battalion, brigade, or line, of cavalry, artillery, or infantry. It has always been lamented, that men have been brought on service without being informed of the uses of the different manœuvres they have been practising; and, having no ideas of any thing but the uniformity of the parade, instantly fall into disorder and confusion when they lose the step, or see a deviation from the straight lines they have been accustomed to at exercise. It is a pity to see so much attention given to show, and so little to instruct the troops in what may be of use

Mannory,
Manœuvres.

† Harley
earl of Ox-
ford, lord
high trea-
surer to
Queen
Anne.

Manometer. to them in real service. No manœuvre should be executed in presence of the enemy, unless protected by some division of the troops.

MANOMETER, or **MANOSCOPE**, an instrument to show or measure the alterations in the rarity or density of the air. The manometer differs from the barometer in this, That the latter only serves to measure the *weight* of the atmosphere, or of the column of air over it; but the former, the density of the air in which it is found; which density depends not only on the weight of the atmosphere, but also on the action of heat and cold, &c. Authors, however, generally confound the two together; and Mr Boyle himself gives us a very good manometer of his contrivance, under the name of a *statical barometer*, consisting of a bubble of thin glass, about the size of an orange, which, being counterpoised when the air was in a mean state of density, by means of a nice pair of scales, sunk when the atmosphere became lighter, and rose as it grew heavier.

Another kind of manometers were made use of by colonel Roy, in his attempts to correct the errors of the barometer, and are described in the Philosophical Transactions, Vol. LXVII. p. 689. "They were (says he) of various lengths, from four to upwards of eight feet: they consisted of straight tubes, whose bores were commonly from $\frac{1}{16}$ th to $\frac{1}{8}$ th of an inch in diameter. The capacity of the tube was carefully measured, by making a column of quicksilver, about three or four inches in length, move along it from one end to the other. These spaces were severally marked, with a fine-edged file, on the tubes; and transferred from them to long slips of pasteboard, for the subsequent construction of the scales respectively belonging to each. The bulb, attached to one end of the manometer at the glass-house, was of the form of a pear, whose point being occasionally opened, dry or moist air could be readily admitted, and the bulb sealed again, without any sensible alteration in its capacity.

"The air was confined by means of a column of quicksilver, long or short, and with the bulb downward or upwards, according to the nature of the proposed experiment. Here it must be observed, that, from the adhesion of the quicksilver to the tube, the instrument will not act truly, except it be in a vertical position; and even then it is necessary to give it a small degree of motion, to bring the quicksilver into its true place; where it will remain in equilibrio, between the exterior pressure of the atmosphere on one side, and the interior elastic force of the confined air on the other.

"Pounded ice and water were used to fix a freezing point on the tube; and by means of salt and ice, the air was farther condensed, generally four, and sometimes five or six degrees below zero. The thermometer and manometer were then placed in a tin vessel among water, which was brought into violent ebullition; where having remained a sufficient time, and motion being given to the manometer, a boiling point was marked thereon. After this the fire was removed, and the gradual descents of the piece of quicksilver, corresponding to every 20 degrees of temperature in the thermometer, were successively marked on a deal rod applied to the manometer. It is to be observed, that both instruments, while in the water,

were in circumstances perfectly similar; that is to say, the ball and bulb were at the bottom of the vessel.

"In order to be certain that no air had escaped by the side of the quicksilver during the operation, the manometer was frequently placed a second time in melting ice. If the barometer had not altered between the beginning and end of the experiment, the quicksilver always became stationary at or near the first mark. If any sudden change had taken place in the weight of the atmosphere during that interval, the same was noted, and allowance made for it in afterwards proportioning the spaces.

"Long tubes, with bores truly cylindrical, or of any uniform figure, are scarcely ever met with. Such however as were used in these experiments, generally tapered in a pretty regular manner from one end to the other. When the bulb was downwards, and the tube narrowed that way, the column of quicksilver confining the air lengthened in the lower-half of the scale, and augmented the pressure above the mean. In the upper half, the column being shortened, the pressure was diminished below the mean. In this case, the observed spaces both ways from the centre were diminished in the inverse ratio of the heights of the barometer at each space, compared with its mean height. If the bore widened towards the bulb when downwards, the observed spaces, each way from the centre, were augmented in the same inverse ratio; but in the experiments on air less dense than the atmosphere, the bulb being upwards, the same equation was applied with contrary signs: and if any extraordinary irregularity took place in the tube, the corresponding spaces were proportioned both ways from that point, whether high or low, that answered to the mean.

"The observed and equated manometrical spaces being thus laid down on the pasteboard containing the measures of the tube; the 212° of the thermometer, in exact proportion to the sections of the bore, were constructed along-side of them: hence the coincidences with each other were easily seen; and the number of thermometrical degrees answering to each manometrical space readily transferred into a table prepared for the purpose."

MANOR, **MANERIUM**, (*à manendo*, because the usual residence of the owner), seems to have been a district of ground held by lords or great personages; who kept in their own hands so much land as was necessary for the use of their families, which were called *terre dominicales*, or *demesne lands*; being occupied by the lord, or *dominus manerii*, and his servants. The other, or *tenemental* lands, they distributed among their tenants; which, from the different modes of tenure, were called and distinguished by two different names.—First, *book-land*, or charter-land, which was held by deed under certain rents and free services, and in effect differed nothing from free socage lands: and from hence have arisen most of the freehold tenants who hold of particular manors, and owe suit and service to the same. The other species was called *folk-land*, which was held by no assurance in writing, but distributed among the common folk or people at the pleasure of the lord, and resumed at his discretion; being indeed land held in villenage. See **VILLENAGE**.

The residue of the manor, being uncultivated, was termed

Manometer, Manor.

Blackst. Comments.

Manor,
Mans

termed the *lord's waste*, and served for public roads, and for common of pasture to the lord and his tenants. Manors were formerly called *baronies*, as they still are *lordships*; and each lord or baron was empowered to hold a domestic court, called the *court-baron*, for redressing misdemeanors and nuisances within the manor, and for settling disputes of property among the tenants. This court is an inseparable ingredient of every manor; and if the number of suitors should so fail, as not to leave sufficient to make a jury or homage, that is, two tenants at the least, the manor itself is lost.

In the early times of our legal constitution, the king's greater barons, who had a large extent of territory held under the crown, granted out frequently smaller manors to inferior persons to be held of themselves; which do therefore now continue to be held under a superior lord, who is called in such cases the *lord paramount* over all these manors; and his feignory is frequently termed an *honour*, not a *manor*; especially if it hath belonged to an ancient feudal baron, or hath been at any time in the hands of the crown. In imitation whereof, these inferior lords began to carve out and grant to others still more minute estates, to be held as of themselves, and were so proceeding downwards in *infinitum*, till the superior lords observed, that, by this method of subinfeudation, they lost all their feudal profits of wardships, marriages, and escheats, which fell into the hands of these mesne or middle lords, who were the immediate superiors of the *terre-tenant*, or him who occupied the land; and also that the mesne lords themselves were so impoverished thereby, that they were disabled from performing their services to their own superiors. This occasioned, first, that provision in the 32d chapter of *magna charta*, 9 Hen. III. (which is not to be found in the first chapter granted by that prince, nor in the great charter of King John), that no man should either give or sell his land without reserving sufficient to answer the demands of his lord; and, afterwards, the statute of Westm. 3. or *quia emptores*, 18 Edw. I. c. 1. which directs, that, upon all sales, or feoffments of land, the feoffee shall hold the same, not of his immediate feoffor, but of the chief lord of the fee, of whom such feoffor himself held it. But these provisions not extending to the king's own tenants in *capite*, the like law concerning them is declared by the statutes of *prærogativa regis*, 17 Edw. II. c. 6. and of 34 Edw. III. c. 15. by which last all subinfeudations, previous to the reign of king Edward I. were confirmed; but all subsequent to that period were left open to the king's prerogative. And from hence it is clear, that all manors existing at this day, must have existed as early as king Edward the First: for it is essential to a manor, that there be tenants who hold of the lord; and, by the operation of these statutes, no tenant in *capite* since the accession of that prince, and no tenant of a common lord since the statute of *quia emptores*, could create any new tenants to hold of himself. See VILLENAGE.

MANS, an ancient, rich, and populous town of France, capital of the county of Maine, with a bishop's see. Its wax and stuffs are famous. It is seated on a high hill near the river Sarr, in E. Long. 0. 10. N. Lat. 47. 58. It is an earldom bestowed on William Mur-

ray, chief justice of England, with remainder to the family of Stormont in Scotland.

MANSE, MANSUS, *Mansa*, or *Mansum*; in ancient law-books, denotes an *house*, or habitation, either with or without land. See HOUSE, and MANSION. The word is formed a *manendo*, "abiding;" as being the place of dwelling or residence.

Capital MANSE, (*Mansum Capitale*), denotes the *manor-house*, or lord's court. See MANOR.

MANSUS *Presbyteri*, is a parsonage or vicarage house for the incumbent to reside in. This was originally, and still remains, an essential part of the endowment of a parish-church, together with the glebe and tythes. It is sometimes called *Presbyterium*. See PRESBYTERY.

MANSFELD, a city of Germany, and capital of a county of the same name, in the circle of Upper Saxony. E. Long. 12. 55. N. Lat. 51. 35.

MANSFELD (Peter Ernest, count of), was descended from one of the most illustrious families in Germany, and which has produced the greatest number of distinguished characters. In 1552, he was taken prisoner at Ivoy, where he commanded; and he was afterwards of great service to the Catholics at the battle of Montcontour. In consequence of his great talents, he was employed in affairs of the utmost delicacy and importance. Being made governor of Luxembourg, he maintained tranquillity in that province, while the rest of the Low Countries was a prey to the horrors of civil war. In testimony of their gratitude, the States caused the following inscription to be placed on the gate of the hotel de ville: *In Belgio omnia dum vastat civile bellum, MANSFELDUS bello et pace fidus, hanc provinciam in fide continet servatque illam, cum summo populi consensu et hilari jucunditate*. He was afterward appointed to the command of the Low Countries; and died at Luxembourg, March 21. 1604, at the age of 87, with the title of *Prince of the Holy Empire*. His mausoleum in bronze, which is to be seen in the chapel bearing his name, and adjoining to the Church of the Recollets at Luxembourg, is an admirable work. Four highly finished weepers, with which this monument was ornamented, were carried off by Louis XIV. when he took this city in 1684. To a love of war, Mansfeld united a taste for the sciences; and he was a lover and encourager of the arts: he possessed a great and elevated mind; but, like many heroes ancient and modern, he was greedy of gain and lavish of blood. Abbé Schannat has written the history of the count of Mansfeld in Latin; printed at Luxembourg, 1707. Charles prince of Mansfeld, his lawful son, signalized himself in the wars of Flanders and Hungary; and died without issue in 1595, after having beaten the Turks who attempted to relieve the city of Gran (Strigonia), which he was besieging.

MANSFELD (Ernest de), the illegitimate son of Peter Ernest by a lady of Malines, was educated at Brussels, in the principles of the Roman Catholic religion, by his godfather Ernest archduke of Austria. He was employed in the service of the king of Spain in the Low Countries, and in that of the emperor in Hungary, together with his brother Charles count of Mansfeld. He was legitimated on account of his bravery

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Mansfeld, Mansfield. bravery by the emperor Rodolphus II.; but his father's posts and possessions in the Spanish Netherlands having been refused him, contrary to promises which he had received, he, in 1610, joined the party of the Protestant princes. Being now become one of the most dangerous enemies of the house of Austria, who called him the *Attila of Christianity*, he set himself, in 1618, at the head of the rebels in Bohemia, and got possession of Pilsen in 1619. Though his troops were defeated in several battles, he was able to penetrate into the palatinate. He there took several places, ravaged Alsace, made himself master of Haguenau, and defeated the Bavarians. At length he was totally defeated by Wallstein, at the battle of Daffou, which happened in the month of April 1626. He gave over his remaining troops to the Duke of Weimar, and intended to pass into the Venetian States; but fell sick in a village between Zara and Spalatro, and there expired, A. D. 1626, aged 46. The procurator Nani thus describes him: "He was bold, intrepid in danger, and the most skilful negociator of the age in which he lived. He possessed a natural eloquence, and well knew how to insinuate himself into the hearts of those whom he wished to gain. He was greedy of others wealth, and prodigal of his own.—He was full of vast projects and great hopes, and yet possessed neither lands nor money at his death." He did not wish to die in his bed; but dressed himself in his finest robes, put on his sword, sat up, leaning upon two domestics, and in this position, highly becoming a warrior, breathed his last. But of all the actions of this great captain and singular man, the following is without doubt the most extraordinary: Having got the most certain information that Cazel, in whom of all his officers he placed the greatest confidence, had communicated his plans to the Austrian chief, he showed neither passion nor resentment at his treachery, but gave him 300 rix-dollars, and sent him to count Buquoy, with a letter expressed in these words, "Cazel being attached to you and not to me, I send him to you, that you may have the benefit of his services." The opinions of men were divided about this action, and it was as much censured as applauded. Be this as it may, Ernest is deservedly esteemed one of the greatest generals of his age. There never was a leader more patient, more indefatigable, more inured to toil and hardship, to watchings, to cold, and to hunger. He raised armies, and ravaged the enemy's territories with an incredible celerity. The Hollanders said of him, that he was *bonus in auxilio, carus in pretio*; that is, that he rendered great services to those who employed him, but that he made them pay well for it.

MANSFELD (Henry-Francis, count of), was of the same house with the former, and signalized himself in the wars for the Spanish succession. He died at Vienna on the 8th of June 1715, at the age of 74, after being a prince of the Holy Empire, a grandee of Spain, field-marshal general of the emperor's armies, general of artillery, ambassador to France and Spain, president of the Aulic council, and great chamberlain to the emperor.

MANSFIELD, a town of Nottinghamshire, in England, seated in the forest of Sherwood, 140 miles from London. It was anciently a royal demesne. It

has a market on Thursdays, and two fairs. By an ancient custom of this manor, the heirs were declared of age as soon as born. It is a well-built town, and drives a great trade in malt. Its market is well stocked with corn, cattle, &c. Here is a charity-school for 36 boys.

MANSIO, a term often mentioned in itineraries, denoting *inns* on the public roads to lodge in, at the distance of eighteen miles from each other; (Lactantius). Also, in the lower ages, it came to denote "an encampment for one night," (Lamprius).

MANSIO, or *Manfus*, was sometimes also used in the same sense with *hide*; that is, for as much land as one plough could till in a year. See **HIDE**.

MANSION, **MANSIO**, a dwelling-house, or habitation, especially in the country. See **MANSE**.

MANSION is more particularly used for the lord's chief dwelling-house within his fee; otherwise called the *capital messuage* or *manse*, or chief manor-place. See **MANOR**.

MANSLAUGHTER, the unlawful killing of another, without malice either express or implied: Which may be either voluntarily, upon a sudden heat; or involuntarily, but in the commission of some unlawful act. These were called, in the Gothic constitutions, *homicidia vulgaria; quæ aut casu, aut etiam sponte committuntur, sed in subitaneo quodam iracundie calore et impetu*. And hence it follows, that in manslaughter there can be no accessories before the fact; because it must be done without premeditation.

1. As to the first, or voluntary branch: If upon a sudden quarrel two persons fight, and one of them kills the other, this is manslaughter: and so it is, if they upon such an occasion go out and fight in a field; for this is one continued act of passion: and the law pays that regard to human frailty, as not to put a hasty and deliberate act upon the same footing with regard to guilt. So also if a man be greatly provoked, as by pulling his nose, or other great indignity, and immediately kills the aggressor; though this is not excusable *se defendendo*, since there is no absolute necessity for doing it to preserve himself; yet neither is it murder, for there is no previous malice; but it is manslaughter. But in this, and in every other case of homicide upon provocation, if there be a sufficient cooling-time for passion to subside and reason to interpose, and the person so provoked afterwards kills the other, this is deliberate revenge, and not heat of blood; and accordingly amounts to murder. So if a man takes another in the act of adultery with his wife, and kills him directly upon the spot; though this was allowed by the law of Solon, as likewise by the Roman civil law (if the adulterer was found in the husband's own house), and also among the ancient Goths; yet in England it is not absolutely ranked in the class of justifiable homicide, as in case of a forcible rape, but it is manslaughter. It is, however, the lowest degree of it; and therefore in such a case the court directed the burning in the hand to be gently inflicted, because there could not be a greater provocation. Manslaughter, therefore, on a sudden provocation, differs from excusable homicide *se defendendo* in this: That in one case

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case there is apparent necessity, for self-preservation, to kill the aggressor; in the other no necessity at all, being only a sudden act of revenge.

2. The second branch, or involuntary manslaughter, differs also from homicide excusable by misadventure, in this: That misadventure always happens in consequence of a lawful act, but this species of manslaughter in consequence of an unlawful one. As if two persons play at sword and buckler, unless by the king's command, and one of them kills the other: this is manslaughter, because the original act was unlawful; but it is not murder, for the one had no intent to do the other any personal mischief. So where a person does an act, lawful in itself, but in an unlawful manner, and without due caution and circumspection; as when a workman flings down a stone or piece of timber into the street, and kills a man; this may be either misadventure, manslaughter, or murder according to the circumstances under which the original act was done. If it were in a country village, where few passengers are, and he calls out to all people to have a care, it is misadventure only: but if it were in London, or other populous towns, where people are continually passing, it is manslaughter, though he gives loud warning; and murder, if he knows of their passing and gives no warning at all, for then it is malice against all mankind. And, in general, when an involuntary killing happens in consequence of an unlawful act, it will be either murder or manslaughter according to the nature of the act which occasioned it. If it be in prosecution of a felonious intent, or in its consequences naturally tending to bloodshed, it will be murder; but if no more was intended than a mere civil trespass, it will only amount to manslaughter.

3. As to the punishment of this degree of homicide: The crime of manslaughter amounts to felony, but within the benefit of clergy; and the offender shall be burnt in the hand, and forfeit all his goods and chattels.

But there is one species of manslaughter, which is punished as murder, the benefit of clergy being taken away from it by statute; namely, the offence of mortally stabbing another, though done upon sudden provocation. See STABBING.

MANSTEIN (Christopher Herman of), was born at Petersburg, Sept. 1. 1711, and for a long time served with great distinction as a colonel in the Russian armies. In 1745 he went into the service of the king of Prussia; was appointed major-general of infantry in 1754; and distinguished himself on all occasions by his bravery and his knowledge of the art of war. He was wounded at the battle of Kolin, and soon after killed near Leutmeritz. He was universally regretted by those who knew him; and even the enemy shed tears upon the occasion.—Those leisure moments which the laborious profession of war allowed him to enjoy, Manstein dedicated to study. He was acquainted with almost all the languages of Europe. From him we have Historical, Political, and Military Memoirs of (Russia, Lyons, 1772), 2 vols, 8vo, with plans and charts. These memoirs commence with the death of Catherine I. 1727, and end in 1744. He was an eye-witness, or had a very intimate knowledge, of all the events contained in them. A supplement is added,

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which goes back to the times of the ancient Czars, and in particular treats to a considerable length on Peter I. At the conclusion of the work, the author gives an idea of the military and naval force, of the trade, &c. of this extensive empire. The facts contained in this little historical tract, are not more interesting in themselves than they are valuable on account of the candor of the historian, who witnessed every event which he relates. Mr Hume having received the original French of these memoirs, caused them to be translated into English, and published at London; soon after there appeared a German translation of them, published at Hamburgh. A French edition was published by M. Huber at Leipzig in 1771; and there appeared a new and enlarged edition in 1782.

MANTA, in ichthyology; a flat fish mentioned by Ulloa and others, as exceedingly hurtful to the pearl-fishers, and which seems to be the same with that which Pliny has described under the name of *nubes* or *nebula*: *Ipsi ferunt (Urinatores) et nubem quandam crassescere super capita, planorum piscium similem, prementem eos, arcantemque a reciprocando et ob stilos præacutos lineis annexos habere sese; quia in si perfossa ita, non recedant caliginis et pavoris, ut arbitror, opere. Nubem enim sive nebulam (cujus nomine id malum appellant) inter animalia haud ullam reperit quisquam.* (Plin. Histor. Nat. lib. ix. cap. 46.) The account given of this cloud by those divers is much the same with that which the divers in the American seas give of the manta, and the name of the cloud is perfectly applicable to it, as it really seems to be a cloud to those who are in the water below it: the swimmers likewise carry long knives, or sharp sticks, for the purpose of dispersing this animal. It is not improbable, that this fish has made its way into these seas from those of the old world in the same manner as some others appear to have done. The strength of this fish is so great, that it will not only strangle a man whom it embraces or winds itself about, but it has even been seen to take the cable of an anchor and move it from the place where it had been cast. It has been called *manta*, because, when it lies stretched upon the sea, as it frequently does, it seems like a fleece of wool floating upon the water.

MANI'E, a considerable town of France, capital of the Mantois; seated on the river Seine, in E. Long. 1. 45. N. Lat. 48. 58.

MANTEGAR, or MAN-TIGER, as it is sometimes written, in zoology, is the tufted ape, a species of simia. See SIMIA.

MANTEGNA (Andrew), was born in a village near Padua in 1451, and at first employed in keeping sheep. It was observed, that instead of watching over his flock, he amused himself with drawing; and he was placed with a painter who, being delighted with his ease and taste in work, and with his gentle and agreeable conduct in society, adopted him for his son, and made him his heir. At the age of 17, Mantegna was employed to paint the altar of St Sophia in Padua, and the four evangelists. James Bellini, who admired his talents, gave him his daughter in marriage. Mantegna painted, for the duke of Mantua, the *Triumph of Caesar*, which is the chef d'oeuvre of this painter, and has been engraved in *claro-obscuro*, in nine plates. From respect to his extraordinary merit, the duke made

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made him knight of his order. The invention of engraving prints with the graver is commonly ascribed to Mantegna, who died at Mantua in 1517.

MANTELETS, in the art of war, a kind of moveable parapets, made of planks about three inches thick, nailed one over another, to the height of almost six feet, generally cased with tin, and set upon little wheels, so that in a siege they may be driven before the pioneers, and serve as blinds to shelter them from the enemy's small shot.

MANTICHORA, in natural history, a name given by the Roman authors to a fierce and terrible creature, which they describe from the Greeks, who call it sometimes also *mantichora*; but when they write more correctly, *martichora* and *martiora*. We have formed the name *man-tiger* on the sound of the Roman name, tho' expressing a very different sense; and our authors of the histories of animals, figure to us under this name a terrible creature, partly from the accounts of Pliny exaggerated, and partly from their own imagination, with three rows of teeth, and with such a shape as no animal ever possessed. See MANTEGAR.

The whole story of this animal seems founded on the love of the wonderful; and very probably the *mantichora*, properly speaking, was no other than some of the larger hyænas, which was at first ill described, and afterwards more and more wonders were added to the story, till all shadow of truth was lost.

MANTINEA (anc. geog.), a town situated in the south of Arcadia, on the confines of Laconia (Ptolemy); called afterwards *Antigonea*, in honour of king Antigonus. It is memorable for a battle fought in its neighbourhood between the Thebans and Spartans, in which fell the celebrated commander Epaminondas. See THEBES.

MANTIS, in zoology, a genus of insects belonging to the order of hemiptera, the characters of which are these: The head is unsteady, or appears from its continual nodding motion to be slightly attached to the thorax: The mouth is armed with jaws, and furnished with filiform palpi: The antennæ are setaceous: The four wings are membranaceous, and wrapped round the body; the under ones folded: The anterior or first pair of feet are compressed, armed on the under side with teeth like a saw, and terminated by a single nail or crotchet; the four hindermost are gressorii, or formed rather for advancing slowly than for performing quick movements: The thorax is extended to a considerable length, narrow, and throughout of equal size. The name *mantis*, given to this genus, denotes *soothsayer*; because it has been imagined, that this insect, by stretching out its fore feet, divined and pointed out those things that were asked of it. The insect often rests on its four hinder legs only, and holding the two fore ones raised up, joins them together, which has occasioned its being called by the people of Languedoc, where it is very common, *pregadiou*, as if it prayed to God. The country folks moreover main-

tain, that this creature shows the way when asked, because it stretches those same fore legs sometimes to the right and sometimes to the left: and indeed it is looked upon as an insect almost sacred, that must not be hurt. Its colour is all over of a brownish green. The young ones have more of the green, the old more of the brown, cast. It deposits its eggs collected in-

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to a hemispherical parcel, flat on one side. There are in the parcel two rows of oblong eggs placed transversely, and one row of shells placed longitudinally, in form of a roof, one over the other, which cover the joining of the two rows of eggs. The whole parcel is light, and as it were composed of very thin parchment.

There are 53 species of this genus. In plate CCLXXIX is represented the gongylodes, the shape of which is extraordinary, being narrow and long. The head is small, flat, with two filiform short antennæ. On the sides of the head are situated two large polished eyes. The thorax is subciliated, long, narrow, margined, with a longitudinal rising in the middle, and a transverse depression at one-third of its length. The elytra, which cover two thirds of the insect, are veined, reticulated, crossed one over the other, and cover the wings, which are veined, and diaphanous. The hinder legs are very long, the middle ones shorter; and the foremost pair of thighs are terminated with spines, the rest winged, as it were, with membranaceous lobes. The top of the head has the shape of an awl; is membranaceous, often split in two at the extremity. It is an inhabitant of China.

The insects belonging to this genus, in their most perfect state, are generally of very beautiful green colours, which soon fade, and become the colour of dead leaves. Their elytra bearing so strong a resemblance to the leaves of some plants, have procured them the name of *walking leaves*.

MANTLE, or *MANTLE-Tree*, in architecture, the lower part of the chimney, or that piece of timber which is laid across the jaumbs, and sustains the compartments of the chimney-piece.

MANTLE, or *Mantling*, in heraldry, that appearance of folding of cloth, flourishing, or drapery, which in any achievement is drawn about a coat of arms. See HERALDRY, p. 464. Sect. V.

MANTO, in poetic history, the daughter of Tiresias, and like her father strongly inspired with prophecy. She was in so great esteem, that when the Argives pillaged Thebes, they thought they could not acquit their vow to Apollo, of consecrating to him the most precious thing in their plunder, without offering him this young woman. She was therefore sent to the temple of Delphi. But this did not engage her in any vow of continency; or, if it did, she observed it very ill: for she bore a son called *Amphilocus* to Alcmeon, who had been generalissimo of the army which took Thebes; and a daughter to the same, named *Tisiphone*. These children were the fruits of an amour carried on during the madness which had seized Alcmeon, after he had put his mother to death. Virgil transports her into Italy, not for the sake of securing her virginity, but to produce a son of her who built Mantua.

MANTUA, anciently a town of the Transpadana in Italy, situated on the Mincius, a river running from the Lacus Benacus. It is said to have been founded about 300 years before Rome by Bianor or Ocnus, the son of Manto; and was the ancient capital of Etruria. When Cremona, which had followed the interest of Brutus, was given to the soldiers of Octavius, Mantua also, which was in the neighbourhood, shared the common calamity, and many of the inhabitants

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were tyrannically deprived of their possessions. Virgil, who was among them and a native of the town, applied for redress to Augustus, and obtained it by means of his poetical talents.

It is still called MANTUA, and is the capital of the duchy of that name. It is now a large place, having eight gates and about 16,000 inhabitants. The streets are broad and straight, and the houses well built. It is very strong by situation as well as by art; lying in the middle of a lake, or rather morass, formed by the river Minchio. There is no access to the city but by two causeways which cross this morass, and which are strongly fortified: so that the city is looked upon to be one of the most considerable fortresses of Europe; and the allies in 1745, though their army was in the duchy, durst not undertake the siege. It was greatly noted for its silk-manufactures, which are now much decayed. The air in the summer-time is very unwholesome. The celebrated poet Virgil was born at a village near this city. E. Long. 10. 47. N. Lat. 45. 10.

MANTUA, the duchy of, a country of Italy, lying along the river Po, which divides it into two parts. It is bounded on the north by the Veronese; on the south by the duchies of Reggio, Modena, and Mirandola; on the east by the Ferrarese; and on the west by the Cremonese. It is about 50 miles in length, and 25 in breadth; is fruitful in corn, pastures, flax, fruits, and excellent wine. Charles IV. the last duke of Mantua, being a vassal of the empire, took part with the French in the dispute relating to the succession of Spain; for which reason he was put under the ban of the empire, and died at Venice in 1708. He having no heirs, the emperor kept the Mantuan in his own hands, and the duke of Savoy had Montferrat, which were confirmed to them by subsequent treaties. After the death of the emperor in 1740, his eldest daughter, now empress-queen, kept possession of the Mantuan; and the governor of the Milanese had the administration of affairs. The Mantuan comprehends the duchies of Mantua, Guastalla, and Sabioneta; the principalities of Castiglione, Solferino, and Bosolo; likewise the county of Novellara. The principal rivers are the Po, the Oglio, and the Minchio; and the principal town is Mantua.

MANTUAN (Baptist), a famous Italian poet, born at Mantua in 1448. He took his name from the town; not having a right to that of his father, as being a natural son. In his youth, he applied himself to Latin poetry, which he cultivated all his life; for it does not appear that he wrote any thing in Italian. He entered among the Carmelites, and became general of the order; though he quitted that dignity upon some disgust in 1515, and died the year following. The duke of Mantua, some years after, erected a marble statue to his memory crowned with laurel, and placed it next to Virgil. His works were collected and published at Paris in three volumes folio in 1513, with the commentaries of St Murrhon, S. Brant, and L. Badius.

MANUAL, a word signifying any thing performed by the hand.

MANUAL (*manualis*), in law, signifies what is employed or used by the hand, and whereof a present profit may be made: as such a thing in the manual

occupation of one is where it is actually used or employed by him.

MANUAL is the name of a service-book used in the church of Rome, containing the rites, directions to the priests, and prayers used in the administration of baptism and other sacraments; the form of blessing holy water, and the whole service used in processions.

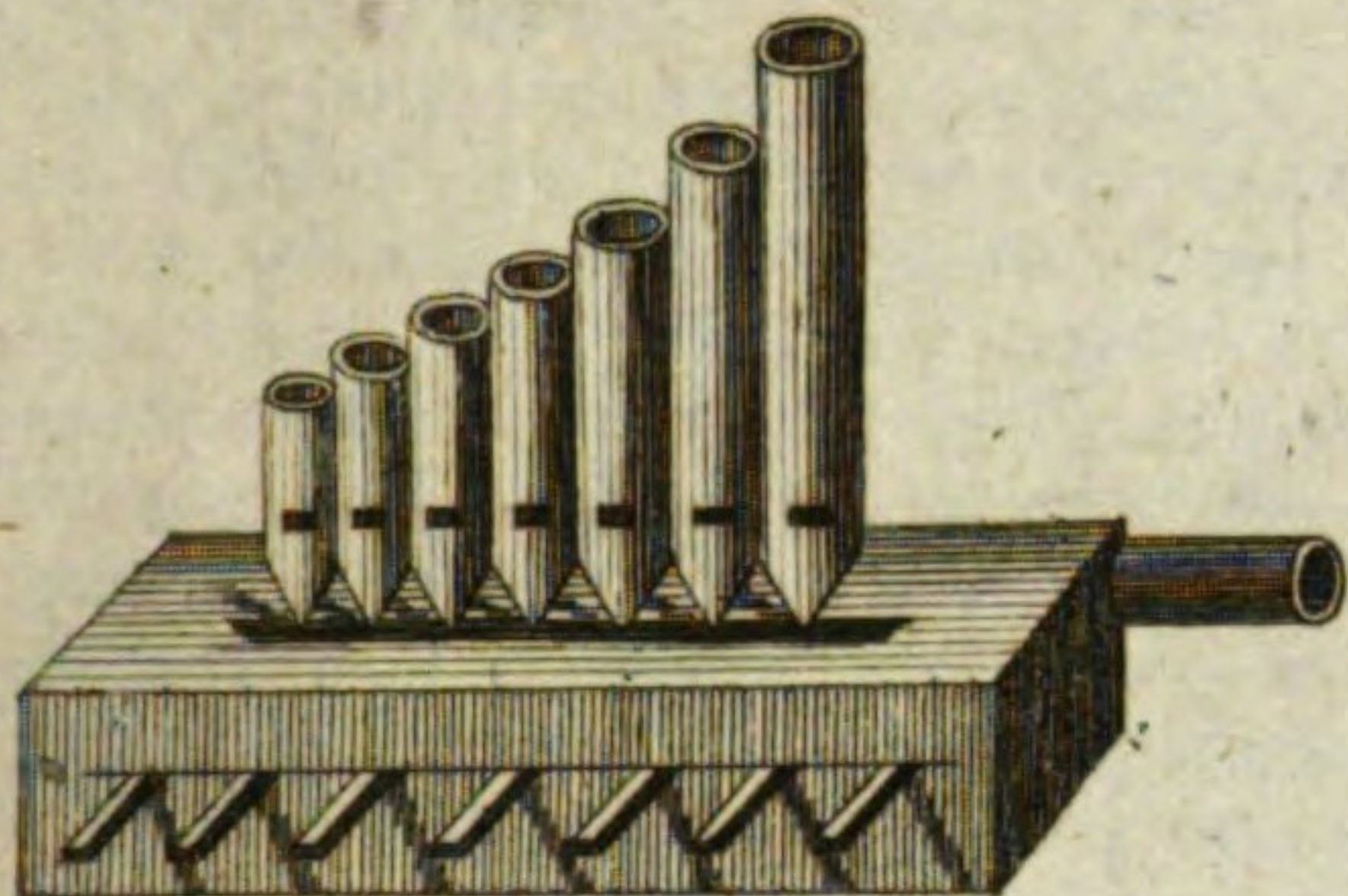
MANUAL Exercise, in the army, consists in the observance of certain words of command appointed for this purpose. When a regiment is drawn up, or paraded for exercise, the men are placed three deep, either by companies, or divided into platoons, with the grenadiers on the right. When soldiers are drawn up for exercise, the ranks and files should be exactly even; and each soldier should be instructed to carry his arms well, to keep his firelock steady and even upon his shoulder, with the right hand hanging down, and the whole body without constraint. The distances between the files must be equal, and the ranks eight feet distant from each other. Every motion should be performed with life, and the greatest exactness observed in all firings, wheelings, and marching; and therefore a regiment should never be under arms longer than two hours.

The following is an abstract of the words of command at the manual exercise, with their explanations.

1. *Poise your firelock*: i. e. Seize the firelock with your right hand, and turn the lock outwards, keeping the firelock perpendicular; then bring up the firelock with a quick motion from the shoulder, and seize it with the left hand, just above the lock, so that the fingers may lie upon the stock, with the elbows down, and the thumb upon the stock; the firelock must not be held too far from the body, and the left-hand must be of an equal height with the eyes.
2. *Cock your firelock*: i. e. Turn the barrel opposite to your face, and place your thumb upon the cock, raising your elbow square at this motion; then cock your firelock, by drawing your elbow down, placing your right-thumb on the breech-pin, and the fingers under the guard.
3. *Present*: i. e. Step back about six inches to the rear with the right-foot, bringing the left-toe to the front; at the same time the butt-end of the firelock must be brought to an equal height with the shoulder, placing the left-hand on the swell, and the fore-finger of the right-hand before the trigger, sinking the muzzle a little.
4. *Fire*: i. e. Pull the trigger briskly, and immediately after, bringing up the right-foot to the inside of the left, come to the priming position, with the lock opposite to the right-breast, the muzzle to the height of the hat, keeping it firm and steady; and at the same time seize the cock with the fore-finger and thumb of the right hand, the back of the hand being turned up.
5. *Half-cock your firelock*: i. e. Half-bend the cock briskly with a draw-back of the right-elbow, bringing it close to the butt of the firelock.
6. *Handle your cartridge*: i. e. Bring your right-hand with a short round to your pouch, slapping it hard; seize the cartridge, and bring it with a quick motion to your mouth; bite the top well off, and bring the hand as low as the chin, with the elbow down.
7. *Prime*: i. e. Shake the powder into the pan, placing the three last fingers behind the rammer, with the elbow up.
8. *Shut your pans*: i. e. Shut your pans briskly, drawing your right-arm at this motion

Manual.

Masrahitha.



Nº 2.



Machul.

Nº 1.



Mantis.



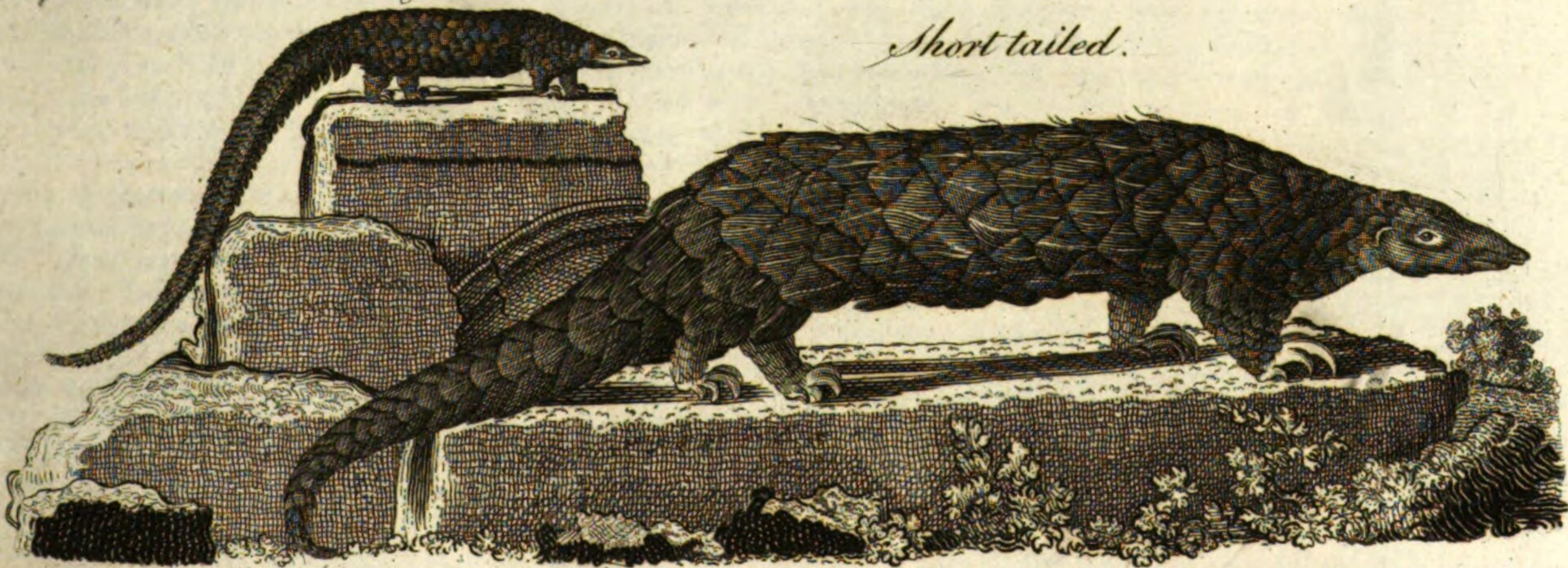
Macpaloochitt.



Long tailed.

Manis, or, Scaly Lizard.

Short tailed.



A. Bell Pin. Wall Sculptor fecit.

Manual.

motion towards your body, holding the cartridge fast in your hand, as before; then turn the piece nimbly round to the loading position, with the lock to the front, and the muzzle to the height of the chin, bringing the right hand behind the muzzle, with both feet kept fast in this motion. 9. *Charge with cartridge*: i. e. Turn up your hand, and put the cartridge into the muzzle, shaking the powder into the barrel; place your hand, closed, with a quick and strong motion, upon the rammer. 10. *Draw your rammer*: i. e. Draw the rammer with a quick motion half out, seizing it at the muzzle back-handed; draw it quite out, turn it, and enter it into the muzzle. 11. *Ram down your charge*: i. e. Ram the cartridge well down in the barrel, instantly recovering and seizing the rammer back-handed at the centre, turning it, and entering it as far as the lower pipe, placing at the same time the edge of the hand on the butt end of the rammer, with fingers extended. 12. *Return your rammer*: i. e. Return the rammer, bringing up the piece with the left-hand to the shoulder, seizing it with the right-hand under the cock, keeping the left-hand fast at the swell, turning the body square to the front. 13. *Shoulder your firelock*: i. e. Quit the left-hand, and place it strong upon the butt; quit the right hand, and throw it down the right-side. 14. *Rest your firelock*: i. e. Seize the firelock with the right-hand, turning the lock outwards; raise the firelock from the shoulder, and place your left-hand with a quick motion above the lock, holding the piece right up and down in both hands before you, and your left-hand even with your eyes; step briskly back with your right-foot, placing it a hand's-breadth distance from your left-heel, and at the same time bring down your firelock as quick as possible to the rest, sinking it as far down before your left-hand as your right-hand will permit without constraint; your left hand being at the feather-spring, and your right, with fingers extended, held under the guard, taking care to draw in the muzzle well towards your body, and to dress in a line with the butt-end. 15. *Order your firelock*: i. e. Place your firelock nimbly with your left-hand against your right-shoulder; quit the firelock with the right-hand, sinking it at the same time with your left; seize it at the muzzle, which must be of an equal height with your chin, and hold it close against your right-side; lift up your right-foot, and place it by your left; at the same time throw back your left-hand by your left-side, and with your right bring down the butt-end strong upon the ground, placing it even with the toe of your right-foot; the thumb of your right-hand lying along the barrel, and the muzzle kept at a little distance from your body. 16. *Ground your firelock*: i. e. Half-face to the right upon your heels, and at the same time turn the firelock, so that the lock may point to the rear, and the flat of the butt-end lie against the inside of your foot; at the same time slipping the right-foot behind the butt of the firelock, the right-toe pointing to the right, and the left to the front: step directly forward with your left-foot, about as far as the swell of the firelock, and lay it upon the ground, your left-hand hanging down by your left-leg, and your right kept fast, with the butt-end against it; raise yourself up again nimbly, bringing back your left-foot to its former position, keeping your body faced to the right;

face again to the left upon your heels, and come to your proper front, letting your hands hang down without motion. 17. *Take up your firelock*: i. e. Face to the right upon both heels; sink your body down, and come to the position described in the second motion of grounding; raise yourself and firelock, bringing it close to your right side; come to your proper front, seizing your firelock at the muzzle, as in explanation 15. 18. *Rest your firelock*: i. e. Bring your right-hand as far as the swell; raise the firelock high up in a perpendicular line from the ground with your right-hand, and seize it with your left above the spring, the cock being at the height of the waist-belt; step back with your right-foot, placing it behind your left-heel, and come to the rest. 19. *Shoulder your firelock*: i. e. Lift up your right-foot, and place it by your left; bring the firelock at the same time to your left-shoulder, and seize the butt-end with the left-hand, keeping it in the same position as above described; throw your right-hand briskly back. 20. *Secure your firelock*: i. e. Bring the right-hand briskly up, and place it under the cock, keeping the firelock steady in the same position; quit the butt with the left-hand, and seize the firelock with it at the swell, bringing the elbow close down upon the lock; the right-hand being kept fast in this motion, and the piece still upright; quit the right-hand, and bring it down your right-side, bringing the firelock nimbly down to the secure; the left-hand in a line with the waist-belt. 21. *Shoulder your firelock*: i. e. Bring the firelock up to a perpendicular line, seizing it with the right-hand under the cock; quit the left-hand, and place it strong upon the butt; quit the right hand, and bring it smartly down the right-side. 22. *Fix your bayonet*: i. e. First and second motions, as in the two first of the secure; quit the right-hand, and bring the firelock smartly down to the left-side with the left-hand, as far as it will admit without constraint, seizing the bayonet at the same time with the right-hand, and fixing it, placing that hand just below the brass, with the piece kept close to the hollow of the shoulder. 23. *Shoulder your firelock*: i. e. Quit the right-hand, and bring up the firelock with the left; seize it again under the cock with your right, as in the second motion of the secure; quit the left-hand, and place it strong upon the butt; quit the right-hand, and bring it down the right side. 24. *Present your arms*: i. e. as explained in three motions of the 14th word of command. 25. *To the right face*: i. e. Bring up the firelock with a quick motion high before you, till your left-hand comes even with your eyes, with the fingers of that hand extended along the stock, just above the feather-spring, the right-foot to be brought close up to the left-heel in this motion; face to the right, taking care in facing to hold the firelock right up and down, and steady in your hands; step back with your right-foot, and come down to your present, as in the foregoing explanation. 26. *To the right face*: i. e. as in the foregoing explanation, facing to the right. 27. *To the right-about face*: i. e. as in the 25th explanation, only coming to the right-about instead of to the right. 28. *To the left face*: i. e. Bring the right-foot briskly to the hollow of your left, with the firelock in the same position as in the first motion of facing to the right; face to the left; come down to the present, as before. 29. *To the left face*: i. e. as

Manual.

Manual. in the foregoing explanation. 30. *To the left-about face*; i. e. as before, coming to the left-about instead of to the left. 31. *Shoulder your firelock*; i. e. as in the two motions of the 19th explanation. 32. *Charge your bayonet*; i. e. as in the first explanation: bring the swell of the firelock down strong upon the palm of the hand, grasping the piece at the small, behind the lock, and as high as the waist-belt; the firelock upon a level with the barrel upwards. 33. *Shoulder your firelock*: i. e. Bring up the firelock to the shoulder, place the left-hand upon the butt, bringing the feet square to the front; quit the right-hand, and throw it down the right side. 34. *Advance your arms*; i. e. first and second motions, as in the first explanation: bring the firelock down the right-side, with the right-hand as low as it will admit without constraint, slipping up the left-hand at the same time to the swell, the guard between the thumb and fore-finger of the right-hand, the three last fingers under the cock, with the barrel to the rear; quit the left-hand. 35. *Shoulder your firelock*; i. e. bring up the left-hand, and seize it at the swell; come smartly up to the poise; shoulder. 36. *Prime and load*: i. e. Come smartly to the recover, by springing the firelock straight up with the left-hand, turning the barrel inwards to the proper height of the recover: at the same time that the left-hand springs the firelock, the right-hand is raised briskly from the right-side, and seizes the firelock across the breast: as it rises below the cock, the left-hand comes with a quick motion from the butt, and seizes the firelock strong above the lock, the little finger of the left-hand at the spring of the lock, the left-hand at an equal height with the face, the butt close to the body, but not pressed, the firelock perpendicular opposite the left-side of the face: bring the firelock down with a brisk motion to the priming position, the left-hand holding the firelock, as in priming; the thumb of the right-hand placed against the face of the steel, the fingers clinched, and the elbow a little turned out, that the wrist may be clear of the cock: open the pan, by throwing up the steel with a strong motion of the right arm, turning the elbow in, and keeping the firelock steady in the left-hand; handle your cartridge, prime, shut your pan, cast about, load, draw rammers, ram down the cartridge, return the rammers, shoulder. N. B. The motion of recover, and coming down to the priming position and opening pans, are to be done in the usual time. The motions of handling cartridge to shutting the pans, are to be done as quick as possible: when the pans are shut, a small pause is to be made, and then cast about together; then the loading motions are to be done as quick as possible; but before the rammer is returned, another small pause is to be made, counting 1, 2, between each motion, till the firelock is shouldered.—*Front rank, make ready*: i. e. Spring the firelock briskly to the recover, keeping the left-foot fast in this motion; as soon as the firelock is at the recover, without any stop, sink the body briskly without stooping forward, with a quick motion down upon the right-knee; the butt-end of the firelock at the same time falls upon the ground, the front part of the butt being in a line with the heel of the left-foot. As soon as the butt comes to the ground, the firelock is to be cocked, immediately seizing the cock and steel in the right-hand; the

firelock to be held firm in the left-hand, about the middle of that part of the firelock between the lock and the swell of the stock; the point of the left-thumb to be close to the swell, pointing upwards. As the body is sinking, the right-knee is to be thrown as far back as the left-leg may be right up and down; the right foot to be thrown a little to the right; the body to be kept straight; the head up, looking to the right along the rank, the same as if shouldered; the firelock to be upright, and the butt about four inches to the right of the inside of the left-foot. *Present*: i. e. Bring the firelock briskly down to the present, by extending the left-arm to the full length with a strong motion; at the same time spring up the butt by the cock with the right-hand, and raise the butt so high upon the right-shoulder, that you may not be obliged to stoop too much with the head; the right-cheek to be close to the butt, and the left-eye shut, and look along the barrel with the right-eye from the breech-pin to the muzzle; keep the left-elbow down in an easy position, and stand as steady as possible; the thumb of the right-hand to remain in the position as described in the third explanation of the manual. *Fire*: i. e. Pull the trigger as directed in the manual; and as soon as the piece is fired, give yourself a strong spring upon your left-leg, raising your body briskly, and straight up, keeping your left-foot fast, and bringing the right-heel to the inside of the left; at the same time the firelock is to be brought up to the priming-position, and half-cocked immediately: a short pause is to be made; then handle cartridge, and go on with the loading motions described in the explanation of *prime and load*.—*Centre rank, make ready*: i. e. Spring the firelock briskly to the recover; so soon as the left-hand seizes the firelock above the lock, the right-elbow is to be nimbly raised a little, placing the thumb of that hand upon the cock; the fingers open by the plate of the lock, and as quick as possible force the piece to the cock, by dropping the elbow, and forcing down the cock with the thumb, stepping at the same time a moderate pace to the right, keeping the left foot fast; as the firelock is cocked, the thumb is to fall below the cock, the right-hand seizing the firelock close under the cock firmly, the fore-finger not to be before the trigger; the piece to be held in this position perpendicular, opposite the left-side of the face, the butt close to the left-breast, but not pressed; the body to be straight, and as full to the front as possible; the head kept up, looking to the right of the rank, that the body and the firelock may not stoop forward, nor lean much out of the rank. *Present*: i. e. Spring the firelock from the body to the arm's length with a quick motion, pressing down the muzzle with the left-hand, and spring up the butt with the right-hand, as in the foregoing explanation of the *front-rank*. *Fire*. As in explanation 4, in the manual, with this difference, that the left-foot is to be brought up to the right, at the same time that the firelock is brought down to the priming position. The loading motions as in the explanations of priming and loading; and at the last motion of shouldering, to spring to the left again, and cover the file-leaders.—*Rear rank, make ready*: i. e. Recover the firelock, and cock as before directed for the centre-rank; as the firelock is recovered and cocked, step briskly straight to the right, with the right-foot,

Manual.

Manuduc- foot, a full pace; bring the left-heel about six inches
tor before the right-foot; the body straight, and as square
Ma: um f- to the front as possible, as in the explanation of the
sion. *centre-rank. Present:* As in explanation *present*, before.
Fire: As in explanation of the *centre rank*; and as
 the firelock is coming down to the priming position,
 the left is to be brought back to the right; and at
 the last motion of shouldering, to spring to the left
 again, and cover the file-leader.

There are some peculiar words of command at the manual exercise of the grenadiers, when apart from the battalion; and also for the cavalry and artillery.

MANUDUCTOR, a name given to an ancient officer in the church; who, from the middle of the choir, where he was placed, gave the signal for the choiristers to sing, and marked the measure, beat time, and regulated the music. The Greeks called him *mesachoros*, because seated in the middle of the choir: but in the Latin church he was called *manuductor*; from *manns* and *duco*, "I lead;" because he led and guided the choir by the motions and gesture of the hand.

MANUFACTURE, a commodity produced from raw or natural materials, either by the work of the hand or by machinery.

MANUFACTURER, one who works up a natural product into an artificial commodity.

MANUMISSION, an act whereby a slave or villain is set at liberty, or let out of bondage. The word comes from the Latin *manus*, "hand;" and *mittere*, "to send;" *quia servus mittebatur extra manum seu potestatem domini sui*. Some authors define manumission an act by which a lord enfranchises his tenants, who till that time had been his vassals, and in a state of slavery inconsistent with the sanctity of the Christian faith.

Among the Romans, the manumission of slaves was performed three several ways. 1. When, with his master's consent, a slave had his name entered in the census or public register of the citizens. 2. When the slave was led before the prætor, and that magistrate laid his wand called *vindicta* on his head. 3. When the master gave the slave his freedom by his testament. Servius Tullus is said to have set on foot the first manner; and P. Valerius Publicola the second. A particular account is given of the third in the Institutes of Justinian. It was not necessary that the prætor should be on his tribunal to perform the ceremony of manumission: he did it any where indifferently, in his house, in the street, in going to bathe, &c. He laid the rod on the slave's head, pronouncing these words, *Dico eum liberum esse more Quiritum*, "I declare him a freeman, after the manner of the Romans." This done, he gave the rod to the lictor, who struck the slave with it on the head, and afterwards with his hand on his face and back; and the notary or scribe entered the name of the new-freed man in the register, with the reasons of his manumission. The slave had likewise his head shaved, and a cup given him by his master as a token of freedom. Tertullian adds, that he had then also a third name given him: if this were so, three names were not a token of nobility, but of freedom. The emperor Constantine ordered the manumissions at Rome to be performed in the churches.

Of manumission there have also been various forms in England. In the time of the Conqueror, villains were manumitted, by the master's delivering them by the right hand to the viscount, in full court, showing them the door, giving them a lance and a sword, and proclaiming them free. Others were manumitted by charter. There was also an implicit manumission; as when the lord made an obligation for payment of money to the bondman at a certain day, or sued him where he might enter without suit, and the like.

MANURE, any thing used for fattening and improving land. See **AGRICULTURE**, Part I. Sect. I. II. and III.

MANUSCRIPT, a book or paper *written with the hand*; by which it stands opposed to a *printed* book or paper. A manuscript is usually denoted by the two letters MS. and in the plural by MSS. What makes public libraries valuable is the number of ancient manuscripts repositied in them; see **ALEXANDRIAN**, **CAMBRIDGE**, **CLERMONT**, **COTTONIAN**, **HARLEIAN**, **VATICAN**, &c.

MANUTIUS (Aldus), the first of those celebrated Venetian printers who were as illustrious for their learning as for uncommon skill in their profession. He was born at Bassano in Italy about the middle of the 15th century; and hence is sometimes called *Bassianus*, though generally better known by the name of *Aldus*. He was the first who printed Greek neatly and correctly; and acquired so much reputation by it, that whatever was finely printed was proverbially said to have "come from the press of Aldus." We have a kind of Greek grammar of his; with Notes upon Homer, Horace, &c. He died at Venice, where he exercised his profession, in 1516.

MANUTIUS (Paulus), son of the former, was brought up to his father's profession. He was more learned than him; and he acquired, by continual reading of Tully, such a purity in writing Latin, that even Scaliger allows a Roman could not exceed. Pope Pius IV. placed him at the head of the apostolical press, and gave him the charge of the Vatican library. His Epistles are infinitely laboured, and very correct; but, as may be said of most of the Ciceronians, they contain scarcely any thing but mere words. This constant reading of Tully, however, together with his profound knowledge of antiquity, qualified him extremely well for an editor of Tully; whose works he accordingly published, with Commentaries on them, in 4 vols folio, at Venice in 1523. He died in 1574.

MANUTIUS (Aldus), the Younger, the son of Paulus, and the grandson of Aldus, was esteemed one of the greatest geniuses and most learned men of his time. Clement VIII. gave him the direction of the Vatican printing-house; but probably the profits of that place were very small, since Manutius was obliged, for his subsistence, to accept of a professor of rhetoric's chair, and to sell the excellent library that was in his family, which his father, his uncle, and his great-uncle, had collected with extraordinary care, and which it is said contained 80,000 volumes. He died at Rome in 1597, without any other recompense than the praises due to his merit. He wrote, 1. Commentaries on Cicero. 2. A treatise on orthography. 3. Three books of epistles; and other works in Latin and Italian, which are esteemed.

MAON,

Manure
 ||
 Manutius.

Maon ||
 Maracaybo. MAON (anc. geog.), a town of the tribe of Judah, to the south-east, towards the Dead Sea. It gave name to the *wilderness of Maon*, 1 Sam. xxii.

MAP, a plain figure, representing the surface of the earth, or a part thereof, according to the laws of perspective. See GEOGRAPHY, n° 63—73.

MAPLE. See ACER.

MAPLE-Sugar. See SUGAR.

MAPLETOFT (Dr John), descended from a good family in Huntingdonshire, was born in 1631. He was educated in Trinity-college, Cambridge, and qualified himself for the profession of physic; and in 1675 was chosen professor of that art at Gresham college. He translated Dr Sydenham's *Observationes Medicae circa morborum acutorum historiam et curationem* into the Latin, and Sydenham dedicated them to Mapletoft. He married in 1679, and soon after transferred his studies from physic to divinity; took orders; obtained the vicarage of St Laurence Jewry, with the lectureship of St Christopher's in London; and having been a benefactor to Sion college, was, in 1707, elected president. He continued to preach in his church of St Laurence Jewry till he was above 80 years of age; and in his decline printed a book intitled *The principles and duties of the Christian religion*, &c. 8vo. 1710, a copy of which he sent to every house in his parish. He was a polite scholar; and besides some other pieces on moral and theological subjects, there are in the Appendix to Ward's Lives of the professors of Gresham-college, three Latin lectures read there by him, on the origin of the art of medicine, and the history of its invention.

MAPPA, in the public games of the Roman circus, was a napkin hung out at the prætor's or other great magistrate's seat, as a signal for the race or other diversions to begin. The mappa was received by the mapparius, or person who held it, from the consul, prætor, or other great officer. Notice was anciently given by sound of trumpet; but Nero is said to have introduced the mappa, by throwing his napkin out of the window to satisfy the people, who grew noisy at the delay of the sports while he was at dinner.

MAPPARIUS, in Roman antiquity, the officer who gave the signal to the gladiators to begin fighting; which he did by throwing an handkerchief that he had received from the emperor or other magistrate.

MARACANDA (anc. geog.), capital of the Sogdiana. Now thought to be *Samarcand*, a city of Ussac Tartary in Asia, the country and royal residence of Tamerlane. See SAMARCAND.

MARACAYBO, a rich and considerable town of South America, and capital of the province of Venezuela, seated near a lake of the same name. It carries on a great trade in skins and chocolate, which is the best in America; and they have likewise very fine tobacco. It was taken by the French bucaniers in 1666 and 1678. W. Long. 70. 45. N. Lat. 10. 0.

MARACAYBO, a lake in South America, 200 miles long and 100 broad, which discharges itself by a river into the North Sea. It is well defended by strong forts; which, however, did not hinder Sir Henry Morgan, a bucanier, from entering it, and plundering several Spanish towns on the coast, after defeating a squadron sent out against him.

MARAGNAN, a province of Brazil in South America, which comprehends a fertile populous island, 112 miles in circumference. The French settled here in 1612, and built a town; but they were soon driven from thence by the Portuguese, who have possessed it ever since. The town is little, but strong; and has a castle, a harbour, and a bishop's see. The climate is very agreeable and wholesome, and the soil produces plenty of all the necessaries of life. W. Long. 54. 35. S. Lat. 2. 0.

MARALDI (James Philip), a learned mathematician and astronomer, of the academy of sciences at Paris, was born in 1665. He was the son of Francis Maraldi and Angela Catharine Casini, the sister of the famous astronomer of that name. His uncle made him go to France in 1687, where he acquired great reputation on account of his learning and observations. He made a catalogue of the fixed stars, which is more particular and exact than Bayer's; and has given a great number of curious and interesting observations in the memoirs of the academy; in particular, those on bees and petrifications have been universally applauded. He died in 1729.

MARANA (John Paul), an ingenious writer of the 17th century, was of a distinguished family, and born at Genoa; where he received an education suitable to his birth, and made a great progress in the study of polite literature and the sciences. Having been engaged in the conspiracy of Raphael della Terra, to deliver up Genoa to the duke of Savoy, he was in 1670, when 28 years of age, imprisoned in the tower of that city, and remained there four years. Being at length set at liberty, he was ordered to write the history of that conspiracy; but, when finished, it was seized and prevented from being published. When the republic of Genoa was at variance with the court of France, Marana, who had always an inclination for that court, was afraid of being imprisoned a second time; and retired to Monaco, where he again wrote the history of the conspiracy in Italian; and, in 1682, went to Lyons to get it printed. From Lyons he went to Paris, where his merit soon acquired him powerful protectors. He spent the rest of his life in a happy and tranquil mediocrity, devoted to study and the society of men of learning; and died in 1693. His history of the conspiracy contains many curious and interesting anecdotes, which are nowhere else to be found. He also wrote several other works; the most known of which is the *Turkish Spy*, in 6 vols 12mo, which was in 1742 augmented to seven. Of this ingenious work we have an excellent English translation.

MARANO, a town of Italy, in the territory of Venice and province of Friuli, with a strong citadel; seated in a marsh at the bottom of the Gulph of Venice, which renders it difficult of access.

MARANS, a rich town of France, in the territory of Aunis and diocese of Rochelle, seated among salt marshes, near the river Sevre, three miles from the sea. It carries on a very great trade in corn; and is seated in W. Long. 0. 55. N. Lat. 46. 20.

MARANTA, INDIAN ARROW-ROOT: A genus of the monogynia order, belonging to the monandria class of plants; and in the natural method ranking under the eighth order, *Scitaminea*. The corolla is ringent

Maragnan

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Maranta.

Maranta
||
Marathon.

ringent and quinquefid, with two segments alternately patent. There are three species, the arundinacea, galanga, and comosa, all of them herbaceous perennial exotics of the Indies, kept here in hot-houses for curiosity: they have thick, knotty, creeping roots, crowned with long, broad, arundinaceous leaves, ending in points, and upright stalks, half a yard high, terminated by bunches of monopetalous, ringent, five-parted flowers. They are propagated by parting the roots in spring, and planting them in pots of light rich earth, and then plunging them in the bark-bed. The root of the galanga is used by the Indians to extract the virus communicated by their poisoned arrows; from whence it has derived its name of *arrow root*. The arundinacea, or starch plant, rises to two feet, has broad pointed leaves, small white flowers, and one seed. It is cultivated in gardens and in provision-grounds in the West Indies; and the starch is obtained from it by the following process described by Dr Wright. "The roots when a year old are dug up, well washed in water, and then beaten in large deep wooden mortars to a pulp. This is thrown into a large tub of clean water. The whole is then well stirred, and the fibrous part wrung out by the hands, and thrown away. The milky liquor being passed through a hair sieve, or coarse cloth, is suffered to settle, and the clear water is drained off. At the bottom of the vessel is a white mass, which is again mixed with clean water and drained: lastly, the mass is dried on sheets in the sun, and is pure starch."—A decoction of the fresh roots (the Doctor informs us) makes an excellent ptisan in acute diseases.

MARASMUS, among physicians, denotes an atrophy or consumption in its last and most deplorable stage.

MARATHON (anc. geog.), one of the demi or hamlets of Attica; about 10 miles to the north-east of Athens, towards Bœotia, near the sea. It still retains its ancient name (Dr Chandler informs us); but is very inconsiderable, consisting only of a few houses and gardens. The plain of Marathon, famous for Miltiades's victory over the Persians, by which the liberties of Athens and other cities of Greece were saved, is long and narrow, but consisting chiefly of level ground, and therefore admitting the operations of cavalry, which formed the main strength of the barbarian army, and with which the Greeks were very poorly provided. Here the Persians, under the command of Datis, pitched their camp, by the advice of Hippias the banished king of Athens, whose solicitations and intrigues had promoted the expedition, and whose perfect knowledge of the country, and intimate acquaintance with the affairs of Greece, rendered his opinion on all occasions respectable. The Persian army is said to have consisted of 100,000 infantry, and 10,000 horse.—Athens was in the utmost consternation and dismay. She had, upon the first appearance of the Persian fleet, sent to implore assistance from the other nations of Greece; but some had submitted to Darius, and others trembled at the

very name of the Medes or Persians. The Lacedæmonians alone promised troops; but various obstacles did not allow them immediately to form a junction with those of Athens. This city therefore could only rely on its own strength; and happily at this moment there appeared three men destined to give new energy to the state. These were Miltiades, Aristides, and Themistocles; whose example and harangues kindled the flame of the noblest heroism in the minds of the Athenians. Levies were immediately made. Each of the ten tribes furnished 1000 foot soldiers with a commander at their head. To complete this number it was necessary to enrol the slaves (A.) No sooner were the troops assembled than they marched out of the city into the plain of Marathon, where the inhabitants of Platæa in Bœotia sent them a reinforcement of 1000 infantry.

Scarcely were the two armies in sight of each other, before Miltiades proposed to attack the enemy. Aristides and several of the commanders warmly supported this measure: but the rest, terrified at the excessive disproportion of the armies, were desirous of waiting for the succours from Lacedæmon. Opinions being divided, they had recourse to that of the polemarch, or chief of the militia, who was consulted on such occasions, to put an end to the equality of suffrages. Miltiades addressed himself to him, with the ardour of a man deeply impressed with the importance of present circumstances: "Athens (said he to him) is on the point of experiencing the greatest of vicissitudes. Ready to become the first power of Greece, or the theatre of the tyranny and fury of Hippias, from you alone, Callimachus, she now awaits her destiny. If we suffer the ardour of the troops to cool, they will shamefully bow beneath the Persian yoke; but if we lead them on to battle, the gods and victory will favour us. A word from your mouth must now precipitate your country into slavery or preserve her liberty." Callimachus gave his suffrage, and the battle was resolved. To ensure success, Aristides, and the other generals after his example, yielded to Miltiades the honour of the command which belonged to them in rotation: but, to secure them from every hazard, he preferred waiting for the day which of right placed him at the head of the army.

When that day arrived, Miltiades drew up his troops at the foot of a mountain, on a spot of ground scattered over with trees to impede the Persian cavalry. The Platæans were placed on the left wing; Callimachus commanded the right; Aristides and Themistocles were in the centre of the battle, and Miltiades every where. An interval of nearly a mile separated the Grecian army from that of the Persians. At the first signal the Greeks advanced over this space running. The Persians, astonished at a mode of attack so novel to both nations, for a moment remained motionless; but to the impetuous fury of the enemy they soon opposed a more sedate and not less formidable fury. After an obstinate conflict of some hours, victory began to declare herself in the two wings of the

Marathon.

(A) *Travels of Anacharsis*; authority, *Pausan.* i. 79. But Dr Gillies seems to think that the armed slaves were not included in the 10,000; but amounted of themselves to a greater number, and which formed the centre of the battle.

Marathon. the Grecian army. The right dispersed the enemy in the plain, while the left drove them back on a morass that had the appearance of a meadow, in which they stuck fast and were lost. Both these bodies of troops now flew to the succour of Aristides and Themistocles, ready to give way before the flower of the Persian troops placed by Datis in the centre of his battle. From this moment the rout became general. The Persians, repulsed on all sides, found their only asylum in the fleet which had approached the shore. The conquerors pursued them with fire and sword, and took, burnt, or sunk the greater part of their vessels: the rest escaped by dint of rowing.

The Persian army lost about 6400 men; that of the Athenians 192. Miltiades was wounded; Hippias was left dead on the field, as were Stefileus and Callimachus, two of the Athenian generals. Scarcely was the battle over, when a soldier worn out with fatigue forms the project of carrying the first news of so signal a success to the magistrates of Athens, and without quitting his arms, he runs, flies, arrives, announces the victory, and falls dead at their feet.

This battle was fought on the 6th of Boedromion, in the third year of the 72 Olympiad (or 29th September anno 490 B. C.). The next day 2000 Spartans arrived. In three days and nights they had marched 1200 stadia. Though informed of the defeat of the Persians, they continued their march to Marathon, nor did they enviously shun to behold those fields where a rival nation had signalized itself by so heroic an action: they there beheld the tents of the Persians still standing, the plain strewed over with dead, and covered with costly spoils: they there found Aristides, who with his tribe was guarding the prisoners and booty; and did not retire until they had bestowed just applauses on the victors.

The Athenians neglected nothing to eternise the memory of those who fell in the battle. It had been usual to inter the citizens who perished in war, at the public expence, in the Ceramicus without the city; but the death of these was deemed uncommonly meritorious. They were buried, and a barrow was made for them, where their bravery had been manifested. Their names were engraven on half columns erected on the plain of Marathon. These monuments, not excepting those of the generals Callimachus and Stefileus, were in a style of the greatest simplicity. In the intervals between them were erected trophies bearing the arms of the Persians. An artist of eminence had painted all the circumstances of the battle in one of the most frequented porticoes of the city: Miltiades was there represented at the head of the generals, and in the act of exhorting the troops to fight for their country.

Pausanias examined the field of battle about 600 years after this event. His account of it is as follows. "The barrow of the Athenians is in the plain, and on it are pillars containing the names of the dead under those of the tribes to which they belonged; and there is another for the Platænsians and slaves; and a distinct monument of Miltiades the commander, who survived this exploit. There may be perceived nightly the neighing of horses and the clashing of arms. No person has derived any good from waiting on purpose to behold the spectres; but their anger does not fall

on any one who happens to see them without design. The Marathonians worship those who were slain in the battle, styling them *heroes*.—A trophy also of white marble has been erected. The Athenians say the Medes were buried, religion requiring that the corpse of a man be covered with earth; though I was not able to find any place of sepulture; for there is no barrow or other sign visible, but they threw them promiscuously into a pit.—Above the lake are the marble mangers of the horses of Artaphernes, with marks of a tent on the rocks."

Many centuries have elapsed since the age of Pausanias; but the principal barrow, it is likely that of the gallant Athenians, still towers above the level of the plain. It is of light fine earth, and has a bush or two growing on it. Dr Chandler informs us that he enjoyed a pleasing and satisfactory view from the summit; and looked, but in vain, for the pillars on which the names were recorded, lamenting that such memorials should ever be removed. At a small distance northward is a square basement of white marble, perhaps part of the trophy. A Greek church has stood near it; and some stones and rubbish, disposed so as to form an open place of worship, remain.

MARATTA. See MARHATTAS.

MARATTI (Carlo), a celebrated painter, was born at Camorano, near Ancona, in 1625. He came a poor boy to Rome, when only 11 years old; and at 12 recommended himself so effectually to Andrea Sacchi, by his drawings after Raphael in the Vatican, that he took him into his school, where he continued 25 years till his master's death. His graceful and beautiful ideas occasioned his being generally employed in painting madonas and female saints. No man ever performed in a better style, or with a greater elegance. From the finest statues and pictures, he made himself master of the most perfect forms, and the most charming airs of heads, which he sketched with equal ease and grace. He has produced a noble variety of draperies, more artfully managed, more richly ornamented, and with greater propriety than even the best of the moderns. He was inimitable in adorning the head, in the disposal of the hair, and the elegance of his hands and feet, which are equal to those of Raphael; and he particularly excelled in gracefulness. In his younger days he etched a few prints, as well of his own invention as after others, with equal spirit and correctness. It would be endless to recount the celebrated paintings done by this great man. Yet he executed nothing slightly, often changed his design, and almost always for the better, whence his pictures were long in hand. By the example of his master, he made several admirable portraits of popes, cardinals, and other people of distinction, from whom he received the highest testimonies of esteem, as he likewise did from almost all the monarchs and princes of Europe. Innocent XI. appointed him keeper of the paintings in his chapel and the Vatican. Maratti erected two noble monuments for Raphael and Hannibal, at his own expence, in the Pantheon. How well he maintained the dignity of his profession, appears by his answer to a Roman prince, who complaining of the excessive price of his pictures, he told him there was a vast debt due from the world to the famous artists his predecessors, and that he, as their rightful successor, was come to claim

Marauding claim those arrears. His abilities in painting were accompanied with many virtues, and particularly with an extensive charity. This great painter died at Rome in 1713, in the 88th year of his age.

||
Marble.

MARAUDING, in a military sense, means a party of soldiers, who, without any order, go into the neighbouring houses and villages, when the army is either in camp or garrison, to plunder and destroy, &c. Marauders are a disgrace to the camp, to the military profession, and deserve no better quarter from their officers than they give to poor peasants, &c.

MARAVEDI, a little Spanish copper coin, worth somewhat more than a French denier, or half a farthing English.

The Spaniards always count by maravedis, both in commerce and in their finances, though the coin itself is no longer current among them. Sixty-three maravedis are equivalent to a rial of silver; so that the piafter, or piece of eight rials, contains 504; and the pistole of four pieces of eight, 2016 maravedis.

This smallness of the coin produces vast numbers in the Spanish accounts and calculation; insomuch that a stranger or correspondent would think himself indebted several millions for a commodity that cost but a few pounds.

In the laws of Spain, we meet with several kinds of maravedis; Alphonfine maravedis, white maravedis, maravedis of good money, maarvedis Combrenos, black maravedis, and old maravedis. When we find maravedis alone, and without any addition, it is to be understood of those mentioned above. The rest are different in value, fineness of metal, time, &c. Mariana asserts, that this coin is older than the Moors; that it came from the Goths; that it was anciently equal to a third part of the rial, and consequently of 12 times the value of the present maravedi. Under Alphonfus XI. the maravedi was 17 times, under Henry II. ten times, under Henry III. five times, and under John II. two times and an half, the value of the present maravedi.

MARBELLA, a town of Andalusia in Spain, situated at the mouth of the Rio Verde, 30 miles north-east of Gibraltar, and 28 south-west of Malaga. W. Long. 5. 25. N. Lat. 30. 25.

MARBLE, in natural history, a genus of fossils; being bright and beautiful stones composed of small separate concretions, moderately hard, not giving fire with steel, fermenting with and soluble in acid menstrua, and calcining in a slight fire.—The word comes from the French *marbre*, and that from the Latin *marmor*, of the Greek *μαρμαίρειν* to “shine or glitter.”

The colours by which marbles are distinguished are almost innumerable; but the most remarkable are,
1. The black marble of Flanders. 2. Plain yellow.
3. Yellow with some white veins. 4. Yellow with black dendrites. 5. Yellow with brown figures resembling ruins. 6. Black and yellow. 7. Black and white. 8. Pale yellow, with spots of a blackish-grey colour. 9. Yellow, white, and red. 10. Pale yellow. 11. Olive colour, with deeper coloured cross lines, and dendrites. 12. Brownish red. 13. Flesh-coloured and yellow. 14. Common red marble. 15. Crimson, white, and grey. 16. Reddish-brown lumps, on a whitish ground. 17. Bluish grey. 18. Snowy-white.

The varieties of marble, numerous as they are, have

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been improperly augmented by virtuosos, and some people who collect specimens for the sake of gain. The Italians are particularly curious in this way; and most of the names imposed upon marbles are given by them. Every marble brought from an unknown place is called by them *antico*; when distinguished by a number of bright colours, it is called *brocatello*, or *brocatellato*. When they want some of the originals to complete a whole set of marbles, they either substitute others which have the nearest resemblance to them; or, lastly, they stain white marbles according to their own fancy, and impose them on the world as natural. The finest solid modern marbles are those of Italy, Blankenburg, France, and Flanders. It has also been lately discovered, that very fine marble is contained in some of the Western Islands of Scotland. Those of Germany, Norway, and Sweden, are of an inferior kind, being mixed with a kind of scaly limestone; and even several of those above mentioned are partly mixed with this substance, though in an inferior degree. Cronstedt, however, mentions a new quarry of white marble in Sweden, which, from the specimens he had seen, promised to be excellent.

The specific gravity of marble is from 2700 to 2800; that of Carrara, a very fine Italian marble, is 2717.—Black marble owes its colour to a slight mixture of iron. Mr Bayen found some which contained 5 per cent. of the metal; notwithstanding which, the lime prepared from it was white, but in time it acquired an ochry or reddish-yellow colour.

Marble, when chemically examined, appears to consist of calcareous earth united with much fixed air; and is, like limestone or chalk, capable of being converted into a strong quicklime.—Dr Black derives the origin of marbles, as well as limestone and marle, from the same source, viz. from the calcareous matter of shells and lithophyta. In one kind of limestone known by the name of *Portland-stone*, and consisting of round grains united together, it was supposed to be composed of the spawn of fish; but comparisons of other phenomena have explained it. It is plain that it has been produced from a calcareous sand, which is found on the shore of some of the islands in the southern climates. By the constant agitation the softer parts are worn off, and the harder parts remain in the form of particles that are highly polished, and which are afterwards gradually made to concrete together by causes of which we have yet no knowledge.—There are indeed some few of the limestones and marbles in which we cannot discover any of the relics of the shells; but there are many signs of their having been in a dissolved or liquified state; so we cannot expect to see the remains of the form of the shells: but even in many of the marbles that have the greatest appearance of a complete mixture, we still find often the confused remains of the shells of which they have been originally composed. We should still find it difficult to conceive how such masses should have derived their origin from shells; but, considering the many collections that we have an opportunity of seeing in their steps towards this process, and a little concreted together, so that by their going a step farther they might form limestone and marbles, we shall soon see the possibility of their being all produced in the same manner. Thus vast quantities

Marble.

titles of shells have been found in the province of Turin in France; and indeed there is no place where they have not been found. The lithophyta likewise seem to be a very fruitful source of this kind of earth. In the cold climates, where the moderate degree of heat is not so productive of animal-life, we have not such an opportunity of observing this: but in the hot climates, the sea, as well as the land, swarms with innumerable animals; and, at the bottom, with those that produce the corals and madripores. We learn from the history of a ship that was sunk in a storm in the Gulf of Mexico, the vast growth there is of these bodies. About 30 years after, they attempted to dive into it to get out a quantity of silver; but they found great difficulty in getting it, from the ship being overgrown with coral. Sir Hans Sloan, in the Philosophical Transactions, and in his history of Jamaica, observes, that the ship's timber, the iron, and money, were all concreted by the growth of the calcareous matter. So in a tract of many thousands of years the quantity of it should be very great; and as this is going on through a very great extent of the bottom of the sea, it will produce very extensive as well as massy collections of calcareous matter.

† Phil.
Transf. vol.
lviii. 12.

According to Sir William Hamilton†, many variegated marbles and precious stones are the produce of volcanoes.

Artificial MARBLES. The stucco, whereof they make statues, busts, basso-relievos, and other ornaments of architecture, ought to be marble pulverized, mixed in a certain proportion with plaster; the whole well sifted, worked up with water, and used like common plaster. See STUCCO.

There is also a kind of artificial marble made of the flaky selenites, or a transparent stone resembling plaster; which becomes very hard, receives a tolerable polish, and may deceive a good eye. This kind of selenites resembles Muscovy talc.

There is another sort of artificial marble formed by corrosive tinctures, which, penetrating into white marble to the depth of a line or more, imitate the various colours of other dearer marbles.

There is also a preparation of brimstone in imitation of marble.

To do this, you must provide yourself with a flat and smooth piece of marble; on this make a border or wall, to encompass either a square or oval table, which may be done either with wax or clay. Then having several sorts of colours, as white lead, vermilion, lake, orpiment, masticot, smalt, Prussian blue, &c. melt on a slow fire some brimstone in several glazed pipkins; put one particular sort of colour into each, and stir it well together; then having before oiled the marble all over within the wall, with one colour quickly drop spots upon it of larger and less size; after this, take another colour and do as before, and so on till the stone is covered with spots of all the colours you design to use. When this is done, you are next to consider what colour the mass or ground of your table is to be; if of a grey colour, then take fine sifted ashes, and mix it up with melted brimstone; or if red, with English red ochre; if white, with white-lead; if black, with lamp or ivory black. Your brimstone for the ground must be pretty hot, that the co-

loured drops on the stone may unite and incorporate with it. When the ground is poured even all over, you are next, if judged necessary, to put a thin wainscot board upon it: this must be done whilst the brimstone is hot, making also the board hot, which ought to be thoroughly dry, in order to cause the brimstone to stick the better to it. When the whole is cold, take it up, and polish it with a cloth and oil, and it will look very beautiful.

Elastic MARBLE, an extraordinary species of fossil which has surprised all the naturalists who have seen it. There are several tables of it preserved in the house of Prince Borghese at Rome, and shown to the curious. F. Jacquer, a celebrated mathematician, has given a description in the Literary Gazette of Paris, but the naturalists cannot be contented with it. If permission was given to make the requisite experiments, this curious phenomenon might be better illustrated. There are five or six tables of that marble; their length is about two feet and a half, the breadth about ten inches, and the thickness a little less than three. They were dug up, as the Abbé Fortis was told, in the feod of Mondragone; the grain is of Carrarese marble, or perhaps of the finest Greek. They seem to have suffered some attack of fire: though the first degree of pulverization observable in the angles, can, perhaps, scarcely be called that of imperfect calcination. They are very dry, do not yield to external impression, resound to the hammer, like other congenerous marble, and are perhaps susceptible of a polish. Being set on end, they bend, oscillating backward and forward; when laid horizontally, and raised at one end, they form a curve, beginning towards the middle; if placed on a table, and a piece of wood or any thing else is laid under them, they make a salient curve, and touch the table with both ends. Notwithstanding this flexibility, they are liable to be broken if indiscreetly handled; and therefore one table only, and that not the best, is shown to the curious. Formerly they were all together in the prince's apartment on the ground-floor.

Colouring of MARBLE. This is a nice art; and, in order to succeed in it, the pieces of marble on which the experiments are tried, must be well polished, and free from the least spot or vein. The harder the marble is, the better will it bear the heat necessary in the operation; therefore alabaster and the common soft white marble are very improper for performing these operations upon.

Heat is always necessary for opening the pores of marble, so as to render it fit to receive the colours: but the marble must never be made red-hot; for then the texture of it is injured, and the colours are burnt, and lose their beauty. Too small a degree of heat is as bad as one too great; for, in this case, though the marble receives the colour, it will not be fixed in it, nor strike deep enough. Some colours will strike even cold; but they are never so well sunk in as when a just degree of heat is used. The proper degree is that which, without making the marble red, will make the liquor boil upon its surface. The menstruums used to strike in the colours must be varied according to the nature of the colour to be used. A lixivium made with horse's or dog's urine, with four parts of quicklime

Marble.

Marble. lime and one of pot-ashes, is excellent for some colours; common ley of wood-ashes is very good for others; for some, spirit of wine is best; and lastly, for others, oily liquors, or common white-wine.

The colours which have been found to succeed best with the peculiar menstruums, are these. Stone-blue dissolved in six times the quantity of spirit of wine, or of the urinous lixivium, and that colour which the painters call *litmus*, dissolved in common ley of wood-ashes. An extract of saffron, and that colour made of buckthorn berries, and called by painters *sap green*, both succeed well when dissolved in urine and quick-lime; and tolerably well when dissolved in spirit of wine. Vermilion, and a very fine powder of cochineal, also succeed very well in the same liquors. Dragon's-blood succeeds in spirit of wine, as does also a tincture of logwood in the same spirit. Alkanet-root gives a fine colour: but the only menstruum to be used for it is oil of turpentine; for neither spirit of wine, nor any lixivium, will do with it. There is another kind of *sanguis draconis*, commonly called *dragon's-blood in tears*, which, mixed with urine, gives a very elegant colour.

Beside these mixtures of colours and menstruums, there are other colours which must be laid on dry and unmixed. These are, dragon's-blood of the purest kind, for a red; gamboge for a yellow; green wax, for a green; common brimstone, pitch, and turpentine, for a brown colour. The marble for these experiments must be made considerably hot, and then the colours are to be rubbed on dry in the lump. Some of these colours, when once given, remain immutable, others are easily changed or destroyed. Thus, the red colour given by dragon's-blood, or by a decoction of logwood, will be wholly taken away by oil of tartar, and the polish of the marble not hurt by it.

A fine gold colour is given in the following manner: Take crude sal ammoniac, vitriol, and verdigrise, of each equal quantities. White vitriol succeeds best; and all must be thoroughly mixed in fine powder.

The staining of marble to all the degrees of red or yellow, by solutions of dragon's-blood or gamboge, may be done by reducing these gums to powder, and grinding them with the spirit of wine in a glass mortar. But, for smaller attempts, no method is so good as the mixing a little of either of those powders with spirit of wine in a silver spoon, and holding it over burning charcoal. By this means a fine tincture will be extracted: and, with a pencil dipt in this, the finest traces may be made on the marble while cold; which, on the heating of it afterwards, either on sand, or in a baker's oven, will all sink very deep, and remain perfectly distinct on the stone. It is very easy to make the ground-colour of the marble red or yellow by this means, and leave white veins in it. This is to be done by covering the places where the whiteness is to remain with some white paint, or even with two or three doubles only of paper; either of which will prevent the colour from penetrating. All the degrees of red are to be given to marble by this gum alone; a slight tincture of it, without the assistance of heat to the marble, gives only a pale flesh colour: but the stronger tinctures give it yet deeper; to this the

assistance of heat adds greatly; and finally, the addition of a little pitch to the tincture, gives it a tendency to blackness, or any degree of deep red that may be desired.

A blue colour may be given also to marble by dissolving turnsol in lixivium, in lime and urine, or in the volatile spirit of urine; but this has always a tendency to purple, whether made by the one or the other of these ways. A better blue, and used in an easier manner, is furnished by the Canary turnsol, a substance well known among the dyers. This needs only to be dissolved in water, and drawn on the place with a pencil: it penetrates very deeply into the marble; and the colour may be increased, by drawing the pencil wetted afresh several times over the same lines. This colour is subject to spread and diffuse itself irregularly: but it may be kept in regular bounds, by circumscribing its lines with beds of wax, or any such substance. It is also to be observed, that this colour should always be laid on cold, and no heat given even afterwards to the marble: and one great advantage of this colour is, that it is therefore easily added to marbles already stained with other colours, is a very beautiful tinge, and lasts a long time.— See also CHEMISTRY, n^o 753.

Arundel MARBLES, marble with a chronicle of the city of Athens, inscribed on them (as was supposed) many years before our Saviour's birth; presented to the university of Oxford by Thomas earl of Arundel, whence the name. See *ARUNDELIAN Marbles*.

MARBLED, something veined or clouded, resembling marble. See **MARBLING**.

MARBLED China-ware, a name given by many to a species of porcelain or china-ware, which seems to be full of cemented flaws. It is called by the Chinese, who are very fond of it, *tsou tchi*. It is generally plain white, sometimes blue, and has exactly the appearance of a piece of China which had been first broken, and then had all the pieces cemented in their places again, and covered with the original varnish. The manner of preparing it is easy, and might be imitated with us. Instead of the common varnish of the China-ware, which is made of what they call *oil of stone* and *oil of fern* mixed together, they cover this with a simple thing made only of a sort of coarse agates, calcined to a white powder, and separated from the grosser parts by means of water, after long grinding in mortars. When the powder has been thus prepared, it is left moist, or in form of a sort of cream, with the last water that is suffered to remain in it and this is used as the varnish. Our crystal would serve full as well as those coarse agates, and the method of preparation is perfectly easy. The occasion of the singular appearance of this sort of porcelain is, that the varnish never spreads evenly, but runs into ridges and veins. These often run naturally into a sort of mosaic-work, which can scarce be taken for the effect of chance. If the marbled China be desired blue, they first give it a general coat of this colour, by dipping the vessel into a blue varnish; and when this is thoroughly dry, they add another coat of this agate-oil.

Playing MARBLES, are mostly imported from Holland; where it is said they are made by breaking the stone alabaster, or other substance, into pieces or chips

Marble,
Marbled.

Marbling. of a suitable size; these are put into an iron mill which turns by water: there are several partitions with rasps within, cut floatways, not with teeth, which turn constantly round with great swiftness; the friction against the rasps makes them round, and as they are formed, they fall out of different holes, into which size or chance throws them. They are brought from Nuremberg to Rotterdam, down the Rhine, and from thence dispersed over Europe.

MARBLING, the method of preparing and colouring the marbled paper.

There are several kinds of marbled paper; but the principal difference of them lies in the forms in which the colours are laid on the ground: some being disposed in whirls or circumvolutions; some in jagged lengths; and others only in spots of a roundish or oval figure. The general manner of managing each kind is, nevertheless, the same; being the dipping the paper in a solution of gum-tragacanth, or, as it is commonly called, *gum-dragon*; over which the colours, previously prepared with ox-gall and spirit of wine, are first spread.

The peculiar apparatus necessary for this purpose, is a trough for containing the gum-tragacanth and the colours; a comb for disposing them in the figure usually chosen; and a burnishing stone for polishing the paper. The trough may be of any kind of wood; and must be somewhat larger than the sheets of paper for marbling which it is to be employed: but the sides of it need only rise about two inches above the bottom; for by making it thus shallow, the less quantity of the solution of the gum will serve to fill it. The comb may be also of wood, and five inches in length; but should have brass teeth, which may be about two inches long, and placed at about a quarter of an inch distance from each other. The burnishing stone may be of jasper or agate; but as those stones are very dear when of sufficient largeness, marble or glass may be used, provided their surface be polished to a greater degree of smoothness.

These implements being prepared, the solution of gum-tragacanth must be made, by putting a sufficient proportion of the gum, which should be white and clear from all foulnesses, into clean water, and letting it remain there a day or two, frequently breaking the lumps and stirring it till the whole shall appear dissolved and equally mixed with the water. The consistence of the solution should be nearly that of strong gum-water used in miniature-painting; and if it appear thicker, water must be added; or if thinner, more of the gum. When the solution is thus brought to a due state, it must be passed through a linen cloth; and being then put into the trough, it will be ready to receive the colours.

The colours employed for red are carmine, lake, rose-pink, and vermilion; but the two last are too hard and glaring, unless they be mixed with rose-pink or lake, to bring them to a softer cast; and with respect to the carmine and lake, they are too dear for common purposes: for yellow, Dutch pink and yellow ochre may be employed:—for blue, Prussian blue and verditer may be used:—for green, verdigrise, a mixture of Dutch pink and Prussian blue, or verditer, in different proportions:—for orange,

the orange-lake, or a mixture of vermilion, or red lead, with Dutch pink:—for purple, rose-pink and Prussian blue.

These several colours should be ground with spirit of wine till they be of a proper fineness; and then, at the time of using them, a little fish-gall, or in default of it the gall of a beast, should be added, by grinding them over again with it. The proper proportion of the gall must be found by trying them; for there must be just so much as will suffer the spots of colour, when sprinkled on the solution of the gum-tragacanth, to join together, without intermixing or running into each other.

When every thing is thus prepared, the solution of the gum-tragacanth must be poured into the trough; and the colours, being in a separate pot, with a pencil appropriated to each, must be sprinkled on the surface of the solution, by shaking the pencil, charged with its proper colour, over it; and this must be done with the several kinds of colour desired, till the surface be wholly covered.

When the marbling is proposed to be in spots of a simple form, nothing more is necessary: but where the whirls or snail-shell figures are wanted, they must be made by means of a quill; which must be put among the spots to turn them about, till the effect be produced. The jagged lengths must be made by means of the comb above described, which must be passed through the colours from one end of the trough to the other, and will give them that appearance: but if they be desired to be pointed both ways, the comb must be again passed through the trough in a contrary direction; or if some of the whirls or snail-shell figures be required to be added, they may be yet made by the means before directed.

The paper should be previously prepared for receiving the colours, by dipping it over-night in water; and laying the sheets on each other with a weight over them. The whole being thus ready, the paper must be held by two corners, and laid in the most gentle and even manner on the solution covered with the colours; and there softly pressed with the hand, that it may bear every-where on the solution. After which it must be raised and taken off with the same care, and then hung to dry across a proper cord, subtended near at hand for that purpose: and in that state it must continue till it be perfectly dry. It then remains only to give the paper a proper polish: in order to which, it is first rubbed with a little soap; and then must be thoroughly smoothed by the glass polishers, such as are used for linen, and called the *calender glasses*. After which it should be again rubbed by a burnisher of jasper or agate; or, in default of them, of glass ground to the highest polish: for on the perfect polish of the paper depends in a great measure its beauty and value.

Gold or silver powders may be used, where desired, along with the colour; and require only the same treatment as them, except that they must be first tempered with gum-water.

Marbling of books or paper is performed thus: Dissolve four ounces of gum-arabic into two quarts of fair water; then provide several colours mixed with water in pots or shells; and, with pencils peculiar to each,

Marc-Antonio

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Marcellianism.

each colour, sprinkle them by way of intermixture upon the gum-water, which must be put into a trough or some broad-vessel; then with a stick curl them, or draw them out in streaks, to as much variety as may be done. Having done this, hold your book or books close together, and only dip the edges in, on the top of the water and colours, very lightly; which done, take them off, and the plain impression of the colours in mixture will be upon the leaves; doing as well the ends as the front of the book in the like manner.

Marbling a book on the covers is performed by forming clouds with aqua-fortis or spirit of vitriol mixed with ink, and afterwards glazing the covers. See the article BOOK-BINDING.

MARC-ANTONIO. See RAIMONDI.

MARCA (Peter de), one of the greatest ornaments of the Gallican church, was born in Bearn, of an ancient family, in 1594. He first studied the law, was made president of the parliament of Bearn, and, going to Paris in 1639, was made a counsellor of state: the good opinion entertained of his knowledge was confirmed by his *History of Bearn*. By the king's order he published a work, *De concordia sacerdotii et imperii, sive de libertatibus ecclesiae Gallicae*, in refutation of a book that appeared under the title of *Optatus Gallus*; and on this account, when on the death of his wife he was nominated bishop of Conserans, the court of Rome refused the bulls in his favour, until by another book he explained away all he had said on behalf of the state, to the limitation of the papal power. He obtained his confirmation, after seven years suspense, in 1648; was translated to the archbishopric of Toulouse in 1652; and was made minister of state in 1658. He died at Paris in 1662, a short time after he had received the bulls as the archbishop of that metropolis. After his death appeared his *Posthumous works*, with prefaces, notes, &c. by M. Baluze. In all he wrote, he showed great abilities and learning, but is reproached for accommodating them to his views of interest and ambition.

MARCASITE, in mineralogy. This name has long been given indifferently to all sorts of minerals; to ores, pyrites, and to semimetals. Lately, it seems to be confined to pyrites, and Wallerius proposes to confine it to such pyrites as are regularly formed. This seems to be better than to leave it a vague and indeterminate signification, on account of the ambiguity and obscurity which might thereby be introduced. See PYRITES.

MARCELLIANISM, the doctrines and opinions of the Marcellians, a sect of ancient heretics, towards the close of the second century, so called from Marcellus of Ancyra, their leader, who was accused of reviving the errors of Sabellius. Some, however, are of opinion, that Marcellus was orthodox, and that they were his enemies the Arians, who fathered their errors upon him. St Epiphanius observes, that there was a great deal of dispute with regard to the real tenets of Marcellus; but that, as to his followers, it is evident they did not own the three hypostases: for Marcellus considered the Son and Holy Ghost as two emanations from the divine nature, which, after performing their respective offices, were to return again into the substance of the Father; and this opinion is

altogether incompatible with the belief of three distinct persons in the Godhead.

MARCELLINUS (Ammianus.) See AMMIANUS.

MARCELLO (Benedict), a celebrated musician, and descended from one of the most illustrious families in Venice. He lived in the beginning of the present century. We have of his composition, anthems, cantatas, and other works, which the connoisseurs rank as high as any of the numerous and excellent musical compositions which the Italian school has produced. "He is the Pindar of music, (says M. de la Borde). In boldness and regularity of design, he is the Michael Angelo of it. In analysing his works, we discover a profound knowledge and great address; but there is a difficulty attending the execution of them which is almost insurmountable. It requires a voice possessed of great powers, and accustomed to the most extraordinary intervals." The chief of the family which still exists was the ambassador of Venice to the Porte in 1770.

MARCELLUS (Marcus Claudius), a famous Roman general, who, after the first Punic war, had the management of an expedition against the Gauls. Here he obtained the *Spolia opima*, by killing with his own hand Viridomarus the king of the enemy. Such success rendered him popular, and soon after he was entrusted to oppose Hannibal in Italy. He was the first Roman who obtained some advantage over this celebrated Carthaginian, and showed his countrymen that Hannibal was not invincible. The troubles which were raised in Sicily by the Carthaginians at the death of Hieronymus, alarmed the Romans; and Marcellus, in his third consulship, was sent with a powerful force against Syracuse. He attacked it by sea and land; but his operations proved long ineffectual, and the invention and industry of Archimedes were able to baffle all the efforts, and to destroy all the great and stupendous machines and military engines of the Romans during three successive years. The perseverance of Marcellus at last obtained the victory. After this conquest, Marcellus was called upon by his country to oppose a second time Hannibal. In this campaign he behaved with greater vigour than before; the greatest part of the towns of the Samnites, which had revolted, were recovered by force of arms, and 3000 of the soldiers of Hannibal made prisoners. Some time after, in an engagement with the Carthaginian general, Marcellus had the disadvantage: but on the morrow a more successful skirmish vindicated his military character and the honour of the Roman soldiers. Marcellus, however, was not sufficiently vigilant against the snares of his adversary. He imprudently separated himself from his camp, and was killed in an ambuscade, in the 60th year of his age, in his 5th consulship, A. U. C. 544. His body was honoured with a magnificent funeral by the conqueror, and his ashes were conveyed in a silver urn to his son. Marcellus claims our commendation for his private as well as public virtues; and the humanity of a general will ever be remembered, who, at the surrender of Syracuse, wept on the thought that many were going to be exposed to the avarice and rapaciousness of an incensed soldiery, which the policy of Rome and the laws of war rendered inevitable.

MARCGRAVE, or MARGRAVE, a kind of dignity.

Marcellinus
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Marcgrave.

March. nity in Germany, answering to our marquis; (see MARQUIS.) The word is derived from the German *Marthe*, or *Marcke*, which signifies "a frontier;" and *Grafte*, "count, governor;" *Marigraves* being originally governors of cities lying on the frontiers of a country or state.

MARCH, MARTIUS, the third month of the year, according to the common way of computing. See MONTH, and YEAR.

Among the Romans, March was the first month; and in some ecclesiastical computations, that order is still preserved; as particularly reckoning the number of years from the incarnation of our Saviour; that is, from the 25th of March.

It was Romulus who divided the year into months; to the first of which he gave the name of his supposed father *Mars*. Ovid, however, observes, that the people of Italy had the month of March before Romulus's time; but that they placed it very differently, some making it the third, some the fourth, some the fifth, and others the tenth month of the year.

In this month it was that the Romans sacrificed to Anna Perenna; that they begun their comitia; that they adjudged their public farms and leases; that the mistresses served the slaves and servants at table, as the masters did in the Saturnalia; and that the vestals renewed the sacred fire.

The month of March was always under the protection of Minerva, and always consisted of 31 days.—The ancients held it an unhappy month for marriage, as well as the month of May.

MARCH, in the military art, is the moving of a body of men from one place to another. Nothing is laid down particularly concerning the marches of the Jewish armies; only thus much we may collect, that they made use of trumpets, to the different sounds of which they prepared themselves by packing up their baggage, putting themselves in readiness, and attending at the standards, to wait the signal for marching. We are told that the army of the Israelites marched in general no more than one league in a day and an half; but this appears to hold good only of their progress through difficult roads: For Follard says they might, in an open country, march four leagues in a day or more. The Rabbins suppose that the Israelites marched in the same order they were placed in their camp. The Greeks, let the posture of their affairs be what it would, never marched against their enemies till favourable omens encouraged the enterprise. An eclipse of the moon, or any untoward accident, or the intervening of what they esteemed an unlucky day, entirely prevented their march. But of all the Greeks the Lacedemonians were the most nice and scrupulous. The heavenly bodies directed all their motions; and it was an invariable maxim with them never to march before the full moon. The Greeks are particularly remarked by Homer for marching in good order and profound silence; whereas the Barbarian forces were all noise, clamour, and confusion. It is needless to say any thing concerning the marches of the Roman armies, more than that they were performed with the greatest order and dispatch, inasmuch that their unexpected presence frequently

March. damped the spirits of their enemies. The Roman soldiers were enured to the military pace, that is, to walk 20 miles in five hours, though at the same time they carried burdens of sixty pounds weight.

Of all the mechanical parts of war, in modern times, none is more essential than that of marching. It may be justly called the *key* which leads to all sublime motions and manœuvres of an army; for they depend entirely on this point. A man can be attacked in four different ways; in the front, on both flanks, and in the rear: but he can defend himself, and annoy the enemy, only when placed with his face towards him. Hence it follows, that the general object of marching is reduced to three points only; to march forwards, and on both sides, because it is impossible to do it for any time backwards, and by that means face the enemy wherever he presents himself.—The different steps to be made use of are three; slow, fast, and oblique. The first is proper in advancing, when at a considerable distance from the enemy, and when the ground is unequal, that the line may not be broke, and a regular fire kept up without intermission. The second is chiefly necessary when you want to anticipate the enemy in occupying some post, in passing a defile, and, above all, in attacking an entrenchment, to avoid being a long while exposed to the fire of the artillery and small arms, &c. The third step is of infinite consequence, both in the infantry and cavalry; columns may be opened and formed into lines, and, *vice versa*, lines into columns, by this kind of step, in a lesser space, and consequently in less time, than by any other method whatsoever. In coming out of a defile, you may instantly form the line without presenting the flank to the enemy. The line may be formed, though ever so near to the enemy, with safety, because you face him, and can with ease and safety protect and cover the motion of the troops, while they are coming out of the defiles, and forming. The same thing may be equally executed, when a column is to be formed in order to advance or retreat; which is a point of infinite consequence, and should be established as an axiom.

The order of march of the troops must be so disposed, that each should arrive at their rendezvous, if possible, on the same day. The quarter-master-general, or his deputy, with an able engineer, should sufficiently reconnoitre the country, to obtain a perfect knowledge of it and the enemy, before he forms his routes.

Before a march, the army generally receives several days bread. The quarter-masters, camp colour-men, and pioneers, parade according to orders, and march immediately after, commanded by the quarter-master-general or his deputy. They are to clear the roads, level the ways, make preparations for the march of the army, &c. The *general*, for instance, beats at 2, the *assembly* at 3, and the army to march in 20 minutes after. Upon beating the *general*, the village, and general officer's guards, quarter and rear-guards, join their respective corps; and the army pack up their baggage. Upon beating the *assembly*, the tents are to be struck, and sent with the baggage to the place appointed, &c.

The

March,
Marchand.

The companies draw up in their several streets, and the rolls are called. At the time appointed, the drummers are to beat a march, and fifers play at the head of the line, upon which the companies march out from their several streets, form battalions as they advance to the head of the line, and then halt.

The several battalions will be formed into columns by the adjutant-general, and the order of march, &c. be given to the general officers who lead the columns.

The cavalry generally march by regiments or squadrons. The heavy artillery always keeps the great roads, in the centre of the columns, escorted by a strong party of infantry and cavalry. The field-pieces march with the columns.

Each soldier generally marches with 36 rounds of powder and ball, and 2 good flints; one of which is to be fixed in the cock of his firelock. The routes must be formed so that no columns cross one another on the march.

MARCHAND (John-Louis), a native of Lyons, who shares with the celebrated *d'Aquin* the glory of having carried the art of playing on the organ to the highest degree of perfection. When very young he went to Paris; and happening to be in the chapel of the college of Louis the Great, when they were waiting for the organist to begin divine service, he offered himself in his place. His playing gave so great satisfaction, that the Jesuits kept him in the college, and supplied him with every necessary to perfect his talents. Marchand continued to play the organ of their chapel; and though many advantageous places were offered to him, he always refused to accept them. This disinterested conduct was not solely owing to his gratitude; for he was of so whimsical and independent a disposition of mind, that he was equally careless about reputation and glory. He died at Paris in 1732, at the age of 63. From him we have two books of Pieces for the Harpsichord, much esteemed by the connoisseurs.

MARCHAND (Professor), was from his youth brought up at Paris, in the profession of a bookseller, and in the knowledge of books. He kept a regular correspondence with several learned men, among whom was Bernard the continuator of the *Nouvelles de la Republique des Lettres*, and furnished this writer with the literary anecdotes of France. Marchand, having embraced the Protestant religion, went to join Bernard in Holland, where he might be at liberty to profess his religious opinions. He continued the trade of bookseller for some time; but afterwards quitted it, that he might dedicate himself wholly to the pursuits of literature. The history of France, together with a knowledge of books and authors, was always his favourite study. In the latter he was so eminently distinguished, that he was consulted from all parts of Europe. He was also one of the principal authors of the *Journal Littéraire*, one of the best periodical works which have appeared in Holland; and he furnished excellent extracts for the other journals. This valuable and learned man died at an advanced age, the 14th of June 1756; and left the little fortune which he had, to a society instituted at the Hague, for the education and instruction of a certain number of poor people. His library, which was excellently chosen for literary history, together with his manuscripts, was left by his

will to the university of Leyden. From him we have,

1. *The History of Printing*, a new edition of which has been promised by one of his friends. This work, which is full of notes and critical discussions, appeared in 1740 at the Hague, in 4to. There is such a prodigious display of erudition, and remarks and quotations are heaped together in such confusion, that when you get to the end of the chaos, you know not what conclusion to form concerning the points which have been discussed. Abbe Mercier, abbot of Saint-Leger de Soissons, gave, in 1775, 4to, a supplement to this history, which is equally curious and accurate. 2. *An Historical Dictionary, or Memoirs Critical and Literary*, printed at the Hague in 1758, in two small volumes, folio. In this work we meet with historical singularities, literary anecdotes, and a discussion of points of bibliography; but too great minuteness prevails in it, the style is deficient in point of purity, and the author is too much carried away by the heat and eagerness of his character. More erudition could not well be collected; especially upon subjects which, at least to the generality of readers, are so uninteresting. 3. A new edition of Bayle's Dictionary, and Letters of the *Cymbalum mundi*, &c.

MARCHANTIA, in botany: A genus of the natural order of algæ, belonging to the cryptogamia class of plants. The male calyx is peltated, and covered below with monopetalous corollæ; the antheræ are multifid; the female calyx is sessile, campanulated, and polyspermous. There are eight species; of which the most remarkable are, 1. The polymorpha, or great star-handed marchantia, is a native of Britain, growing on the banks of rivulets, on shady moist rocks, the sides of wells, and sometimes bogs. The leaves are about three inches long; from half an inch to an inch broad, lying flat on the ground, and adhering closely to it by numerous downy radicles, which grow out of the middle and base of the leaf on the under side. These leaves are situated on their edges; their upper surface of a dark, shining, green colour, reticulated with numerous, minute, rhomboidal, or lozenge-like scales; variously divided into obtuse lobes, and in the middle by a blackish purple vein; their under side is of a paler green, and their substance coriaceous, and nearly opaque. There are three varieties, from one of which is produced a yellow powder, showing a most curious and wonderful mechanism when examined by the microscope. The leaves have a strong aromatic smell, and acrid taste; and are recommended, in a decoction of skimmed milk, as good in the jaundice and other disorders of the liver. 2. The conica, or conic-mushroom marchantia, with warted leaves, grows on moist shady banks by the sides of rivulets. The leaves are broad, flat, about two inches long, dichotomous, obtusely lobed, and lie upon one another. Their surface is of a pale-green glossy colour, curiously tessellated with rhomboidal and hexagonal tubercles, each having a white vesicle or wart in the centre, with a puncture on its head. The leaves have a peculiar strong fragrant smell, and acrid aromatic taste. They are supposed to possess the same attenuating quality as the first, but in a higher degree. They are also recommended as an antiscorbutic, and for thinning the blood.

MARCHE, a province of France, bounded on the north

Marchand

Marche.

Marchena
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Marcianus.

north by Berry, on the east by Auvergne, on the west by Angoumois, and on the south by Limosin. It is about 55 miles in length, and 25 in breadth, and is pretty fertile in corn and wine.

MARCHENA, an handsome, ancient, and considerable town of Spain, in Andalusia, with the title of a duchy, and a suburb as large as the town, seated in the middle of a plain, particularly fertile in olives, though very destitute of water. W. Long. 5. 20. N. Lat. 37. 20.

MARCHERS, or LORDS-MARCHERS, were those noblemen that lived on the marches of Wales or Scotland; who, in times past, according to Camden, had their laws, and *potestatem vitae*, &c. like petty kings, which are abolished by the stat. 27 H. 8. c. 26. and 1 Edw. 6. c. 10. In old records the lords marches of Wales were styled *Marchianes de Marchia Wallie*. See 1 & 2 P. & M. c. 15.

MARCHES (*marchia*), from the German *march*, i. e. *limes*, or from the French *marque*, viz. *signum*, (being the notorious distinction between two countries or territories), are the limits between England and Wales, or between England and Scotland, which last are divided into west and middle marches, 4 Hen. 5. c. 7. 22 Ed. 4. c. 8. 24 Hen. 8. c. 9. And there was formerly a court called the *court of the marches of Wales*, where pleas of debt or damages, not above the value of 50 pounds, were tried and determined; and if the council of the marches held plea for debts above that sum, &c. a prohibition might be awarded. *Hill. 14. Car. 1. Cro. Car. 38.*

MARCHET, or MARCHETTA, a pecuniary fine, anciently paid by the tenant to his lord, for the marriage of one of the tenant's daughters. This custom obtained, with some difference, throughout all England and Wales, as also in Scotland; and it still continues to obtain in some places. According to the custom of the manor of Dinover in Caermarthenshire, every tenant at the marriage of his daughter pays ten shillings to the lord; which, in the British language, is called *gwabr-merched*, i. e. *maid's fee*.

In Scotland, and the north parts of England, the custom was, for the lord to lie the first night with the bride of his tenant: but this usage was abrogated by king Malcom III. at the instance of his queen; and, instead thereof, a mark was paid by the bridegroom to the lord: whence it was called *marcheta mulieris*. See *BOROUGH-English*.

MARCIANA SILVA (anc. geog.), a forest situated between the Rauraci and the Danube, before it comes to be navigable; a part of the Hercynia. Now Schwartzwald, or *Black Forest*, in the south-west of Suabia, near the rise of the Danube and Neckar.

MARCIANUS, a native of Thrace, born of an obscure family. After he had for some time served in the army as a common soldier, he was made private secretary to one of the officers of Theodosius. His winning address and uncommon talents raised him to higher stations; and on the death of Theodosius II. A. D. 450, he was invested with the imperial purple in the east. The subjects of the Roman empire had reason to be satisfied with their choice. Marcianus showed himself active and resolute; and when Attila, the barbarous king of the Huns, asked of the empe-

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ror the annual tribute, which the indolence and cowardice of his predecessors had regularly paid, the successor of Theodosius firmly said, that he kept his gold for his friends, but that iron was the metal which he had prepared for his enemies. In the midst of universal popularity Marcianus died, after a reign of six years, in the 69th year of his age, as he was making warlike preparations against the barbarians that had invaded Africa. His death was long lamented; and indeed his merit was great, since his reign has been distinguished by the appellation of the golden age. Marcianus married Pulcheria the sister of his predecessor. It is said, that in the years of his obscurity he found a man who had been murdered, and that he had the humanity to give him a private burial; for which circumstance he was accused of the homicide, and imprisoned. He was condemned to lose his life; and the sentence would have been executed, had not the real murderer been discovered, and convinced the world of the innocence of Marcianus. — Another emperor of the east, A. D. 479, &c.

MARCIONITES, or MARCIONISTS, *Marcioniste*, a very ancient and popular sect of heretics, who, in the time of St Epiphanius, were spread over Italy, Egypt, Palestine, Syria, Arabia, Persia, and other countries: they were thus denominated from their author Marcion. Marcion was of Pontus, the son of a bishop, and at first made profession of the monastical life; but he was excommunicated by his own father, who would never admit him again into the communion of the church, not even on his repentance. On this he abandoned his own country, and retired to Rome, where he began to broach his doctrines.

He laid down two principles, the one good, the other evil: between these they imagined an intermediate kind of deity of a mixed nature, who was the creator of this inferior world, and the god and legislator of the Jewish nation: the other nations, who worshipped a variety of gods, were supposed to be under the empire of the evil principle. These two conflicting powers exercise oppressions upon rational and immortal souls; and therefore the supreme God, to deliver them from bondage, sent to the Jews a being more like unto himself, even his son Jesus Christ, clothed with a certain shadowy resemblance of a body: this celestial messenger was attacked by the prince of darkness, and by the god of the Jews, but without effect. Those who follow the directions of this celestial conductor, mortify the body by fastings and austerities, and renounce the precepts of the god of the Jews, and of the prince of darkness, shall after death ascend to the mansions of felicity and perfection. The rule of manners which Marcion prescribed to his followers was excessively austere, containing an express prohibition of wedlock, wine, flesh, and all the external comforts of life.

Marcion denied the real birth, incarnation, and passion of Jesus Christ, and held them to be all apparent only. He denied the resurrection of the body; and allowed none to be baptized but those who preserved their continence; but these, he granted, might be baptized three times. In many things he followed the sentiments of the heretic Cerdon, and rejected the law and the prophets. He pretended the gospel had been

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corrupted

Marcio-
nites.

Mareites corrupted by false prophets, and allowed none of the evangelists but St Luke, whom also he altered in many places as well as the epistles of St Paul, a great many things in which he threw out. In his own copy of St Luke he threw out the two first chapters entire.

MARCITES, MARCITE, a sect of heretics in the second century, who also called themselves the *perfecti*, and made profession of doing every thing with a great deal of liberty and without any fear. This doctrine they borrowed from Simon Magus, who however was not their chief; for they were called *Marcites* from one Marcus, who conferred the priesthood, and the administration of the sacraments, on women.

MARCO POLO, PAOLO, or *Paulo*. See PAULO.

MARCOMANNI, an ancient people of Germany, who seem to have taken their name from their situation on the limits or marches, to the east of the Higher Rhine, and the north of the Danube. Cluverius allots to them the duchy of Wurtemberg, a part of the palatinate between the Rhine and the Necker, the Brisgau, and a part of Suabia, lying between the springs of the Danube and the river Bregentz: they afterwards removed to the country of the Boii, whom they expelled and forced to withdraw more to the east, occupying what is now called *Bohemia*. (Strabo, Velleius.)

MARCOSIANS, or COLOBARSIANS, an ancient sect in the church, making a branch of the VALENTINIANS.

St Irenæus speaks at large of the leader of this sect, Marcus, who it seems was reputed a great magician. The Marcosians had a great number of apocryphal books which they held for canonical, and of the same authority with ours. Out of these they picked several idle fables touching the infancy of Jesus Christ, which they put off for true histories. Many of these fables are still in use and credit among the Greek monks.

MARCULUS, among the Romans, a knocker or instrument of iron to knock at the doors with.

MARCUS (Aurelius Antoninus). See ANTONINUS.

MARDIKERS, or TOPASSES, a mixed breed of Dutch, Portuguese, Indians, and other nations, incorporated with the Dutch at Batavia, in the East Indies.

MARE, the female of the horse kind. See the article EQUUS, and HORSE.

Before a mare is covered, she should be in the house about six weeks, during which time she should be well fed with good hay and oats well sifted; and in order to render her conception the more certain, near a quart of blood may be taken from each side of her neck, about five or six days before covering. Another method to bring a mare in season and make her retain, is to give her, for the space of eight days before you bring her to the horse, about two quarts of hemp-seed in the morning, and as much at night; and if she refuses to eat it, to mingle it with a little bran or oats, or else to let her fast for a while: and if the stallion also eat of it, it will greatly contribute to generation.

Mares go with foal 11 months, and as many days as they are years old; and therefore the properest

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time for covering them is in the beginning of June, that they may foal the May following, when there will be plenty of grass, which will afford the mares a great abundance of milk for nourishing their foals. After covering, let her, for three weeks or a month, have the same diet as before, and be kept clean in the stable, with her feet well pared and thin shod: If she cannot readily bring forth, hold her nostrils so as to stop her taking wind; and if that will not do, dissolve madder, to the quantity of a walnut, in a pint of ale and give it her warm. In case she cannot void her secundine, or after-burden, boil two or three handfuls of fennel in running water; then put half a pint of that liquor into as much sack, or, for want thereof, into a pint of ale, with a fourth part of salad-oil, mixed together, and pour it lukewarm into her nostrils, holding them close for some time. Otherwise, give her green wheat, or rye, the last of which is best.

If the mare has but little milk, boil as much as you can get from her with the leaves of lavender and spike, and bathe the udder with it warm, till the knobs and knots are dissolved. She should now drink only white water, which is bran put into water; give her also sweet mash: and a month after foaling, let her have a mash with some brimstone or favin in it.

MAREOTIS, a lake in Egypt near Alexandria. Its neighbourhood was famous for wine; though some make the *Mareoticum vinum* grow in Epirus, or in a certain part of Libya, called also *Mareotis*, near Egypt.

MARETS (Jean de), a Parisian, one of the finest geniuses of the 17th century, became at last a visionary and a fanatic. He was a great favourite of cardinal Richelieu, and possessed an employment of genius under him; for he was called upon to relax and divert him, after the fatigue of business, by facetious conversation. He used, in order to triumph over the virtue of women, when they objected to him the interest of their salvation, to lead them into atheistical principles. He was a member of the French academy from its first erection. He wrote several dramatic pieces, which were well received. He attempted an epic poem; but after spending several years about it, dropped the design to write books of devotion. He likewise wrote romances; but not such virtuous ones as used to be written at that time. He was a declared enemy of the Jansenists. His visions are well described by the Messieurs de Port Royal. He promised the king of France, by the explication of prophecies, the honour of overthrowing the Mahometan empire. In his last years he wrote something against Boileau's Satires.

MARETS (Samuel de), one of the most celebrated divines of the reformed church, was born in Picardy, in 1599. In 1620, he was settled in the church of Laon; but, in 1624, accepted a call to that of Sedan: in 1642, he obtained a professorship at Groningen; and, from that time to his death, exerted himself so much in the service of that university, that it was reckoned one of the most flourishing in the Netherlands. His System of Divinity was found to be so methodical, that it was made use of at other academies; and at the end of it may be found a chronological table of all his works. Their number is prodigious; and their

Margaret. variety shows the extent of his genius. He was more-over engaged in many disputes and controversies, and died in 1673.

MARGARET (St), a celebrated virgin who, as is supposed, received the crown of martyrdom at Antioch in the year 275: the manner of her death is not known. The ancient martyrologists make no mention of her name, and she did not become famous till the 11th century. There is no more foundation for what is said concerning her relics and girdles than for the stories which are told of her life. A festival, however, is still held in honour of her memory on the 20th of July: See *Baillet's Lives of the Saints* for that day. "Her actions (says this author) have been so falsified and altered, in the opinion even of Metaphrastus, that the Romish church have not thought proper to insert any of them into their breviary. The Orientals pay reverence to her by the name of *Saint Pelagia* or *Saint Marina*, and the western church by that of *Saint Geruma* or *Saint Margaret*.

MARGARET, the daughter and heiress of Florent count of Holland, who is famous on account of a story repeated by a hundred compilers even of the present century. Having refused charity to a woman whom she at the same time accused of adultery, she was, as a punishment from God, brought to bed (A. D. 1276) of 365 children, partly boys and partly girls. The boys, it is added, were all named *John*, and the girls *Elizabeth*. This story is represented in a large painting in a village not far from the Hague; and by the side of the painting are seen two large basins of brass, on which it is pretended the 365 children were presented to be baptised. But if a picture is a sufficient authority for the truth of any thing, it is impossible to tell how many fables would be fully attested. It has been remarked, that the most ancient annals are altogether silent concerning this fact; and that it is related only by modern writers, who besides do not agree with one another concerning either the date of time, or the life of the countess, or the number of the children; and in short, that Nassau, who was at that time bishop of Utrecht, was called *John*, and not *Gui*, as the chronicles declare. Several learned men have endeavoured to trace the cause which could have given rise to a relation so extraordinary. M. Struik fixed upon the epitaphs of the mother and son, which appeared to him worthy of some attention; and, in conformity to the dates which they bear, he supposed that the countess was brought to bed on Good-Friday 1276, which was the 26th of March. Now, as the year then began on the 25th of the same month, there were only two days of the year elapsed when the countess was brought to bed, which circumstance caused it to be said that *she had brought into the world as many children as there were days in the year*. In fact only two children are mentioned in history, John and Elizabeth. The fable thus explained is only a common event, wherein there is nothing of the marvellous, but in consequence of a double meaning in the expression. Later writers, who have not examined this circumstance, have ascribed 365 children to the countess. (*Journal des Savans*, February, 1758, on the General History of the United Provinces.)

MARGARET (countess of Richmond and Derby),

the learned and pious mother of Henry VII. was born Margaret. at Betsloe in Bedfordshire, in 1441; and was the sole heiress of John Beaufort duke of Somerset, grandson to John of Gaunt. Her mother was the heiress of Lord Beauchamp of Powick. Whilst yet very young, the great duke of Suffolk, minister to Henry VI. or rather to Queen Margaret, sought her in marriage to his son; and she was at the same time solicited by the king for his half-brother Edmund earl of Richmond. To the latter she gave her hand. Henry VII. was the sole fruit of this marriage, his father dying when he was but 15 weeks old. Her second husband was Sir Henry Stafford, knight, second son to the duke of Buckingham; by whom she had no issue. Soon after his death, which happened in the year 1482, she sought consolation in a third husband, Thomas Lord Stanley, who, in the first year of her son's reign, was created earl of Derby. He died in the year 1504, without issue, being then high constable of England. She survived her lord not quite five years, dying at Westminster in June 1509, in the 69th year of her age. She was buried in Henry VII.'s chapel; on the south side of which was erected to her memory an altar-tomb of black marble, with her statue of brass.

From her funeral sermon preached by her confessor bishop Fisher, who, says Ballard, knew the very secrets of her soul, we learn, "that she possessed almost all things that were commendable in a woman, either in mind or body." She understood the French language perfectly, and had some knowledge of the Latin. She was devout even to austerity, in humility romantic, profuse in the encouragement of learning, and singularly chaste; but this last virtue became conspicuous only towards the latter end of a third marriage. "In her last husband's days (says Baker), she obtained a licence of him to live chaste, whereupon she took upon her the vow of celibacy." "A boon (says Mr Walpole), as seldom requested, I believe, of a third husband, as it probably would be easily granted." Her life, from the turbulence of the times, and vicissitude of her son's fortune, must necessarily have been subject to infinite disquiet, which however she is said to have supported with singular fortitude.—She wrote, 1. The *mirroir of golde* for the sinful soule, translated from a French translation of a book called *Speculum aureum peccatorum*. Emprynted at London, in Flete-strete, at the signe of St George, by Richard Pynson, quarto, with cuts on vellum. 2. Translation of the fourth book of Dr Gersen's treatise of the imitation and following the blessed life of our most merciful Saviour Christ. Printed at the end of Dr Wm. Atkinson's English translation of the three first books, 1504. 3. A letter to the king; in Howard's collection. 4. By her son's order and authority, she also made the Orders for great estates of ladies and noble women, for their precedence, and wearing of barbes at funerals, over the chin and under the same.

MARGARET, the daughter of Woldemar III. king of Denmark, styled the *Semiramis of the North*: she succeeded her father in the throne of Denmark, her husband in that of Norway, and the crown of Sweden was given her as a recompence for delivering the Swedes from the tyranny of Albert their king. Thus possessed

Margarita possessed of the three kingdoms, she formed the grand political design of a perpetual union, which she accomplished, *pro tempore* only, by the famous treaty styled the *union of Colmar*. She died in 1412, aged 59.

||
Margaritini.

MARGARET of Anjou, daughter of René D'Anjou, king of Naples, and wife of Henry VI. king of England; an ambitious, enterprising, courageous woman. Intrepid in the field, she signified herself by heading her troops in several battles against the house of York; and if she had not been the authoress of her husband's misfortunes, by putting to death the duke of Gloucester his uncle, her name would have been immortalised for the fortitude, activity, and policy with which she supported the rights of her husband and son, till the fatal defeat at Tewksbury; which put an end to all her enterprises, the king being taken prisoner, and prince Edward their only son basely murdered by Richard duke of York. Margaret was ransomed by her father, and died in Anjou in 1482. See ENGLAND, n° 201—226.

MARGARET, (duchess of Newcastle.) See CAVENDISH.

MARGARITA, or PEARL-ISLAND, an island of South America, the middle of which is seated in W. Long. 64. 2. N. Lat. 11. 30. It was discovered by Columbus, and is about 35 leagues in compass. The soil is very fertile in maize and fruits, and abounds in pasture and verdant groves; yet is totally destitute of fresh water, which the inhabitants are obliged to bring from the continent. When the Spaniards first landed here, they found the natives busy in fishing for oysters. Columbus ordered some of the savages aboard his ship, who were so far from being terrified, that they very soon became familiar with the Spaniards. The latter at first imagined that the oysters served them for food; but on opening the shells, they found they contained valuable pearls. Upon this discovery they immediately landed, and found the natives ready to part with their pearls for the merest trifles. In process of time the Spaniards built a castle, called *Monpadre*, and employed prodigious numbers of Guinea and Angola negroes in the pearl-fishery; cruelly forcing them to tear up the oysters from the rocks to which they stuck, during which time many of them were destroyed by the sharks and other voracious fishes. In 1620, this island was invaded by the Dutch, who demolished the castle upon it: since which time it has been in a manner abandoned by the Spaniards; and is now principally inhabited by the natives, to whom some particular indulgences were granted by the court of Spain, on account of their ready submission to Columbus.

MARGARITA, the PEARL, in natural history. See PEARL, and MYA.

MARGARITINI, are glass ornaments, made at Venice of small glass tubes of different colours, which are blown at Murano, and which the women of the lower class wear about their arms and necks. The largest sort are used for making rosaries. This work is performed with great dispatch, the artisan taking a whole handful of those tubes at once, and breaking them off one after another with an iron tool. These short cylinders are mixed with a kind of ashes, and put over the fire in an iron pan; and when the two ends begin to melt, by stirring them about with an iron

wire, they are brought to a round figure; but care is taken not to leave them too long over the fire, lest the hole through which they are to be strung should be entirely closed by the melting of the glass. There are several streets at Francesco de Vigna entirely inhabited by people whose sole occupation is to make and string these margaritini.

MARGATE, a sea-port town of Kent, on the north side of the isle of Thanet, near the North-Foreland. It is noted for shipping vast quantities of corn (most, if not all, the product of that island) for London; and has a salt-water bath at the post-house, which has performed great cures in nervous and paralytic cases, and numbness of the limbs. It lies in St John's parish, which is a member of the port of Dover, at the distance of 14 miles, and 12 from Canterbury, and 72 from London; and in the summer season is frequented for sea-bathing, having become one of the principal watering-places for the idle, the opulent, and the invalid, where they meet with every requisite accommodation; and the adjacent country abounds with most extensive prospects and pleasant rides. E. Long. 1. 30. N. Lat. 51. 24.

MARHATTAS, MERHATTAS, MARATTAS, or MAHRATTAS; a people of India, and by far the most considerable of all the Hindoo powers. The Marhattas boast a very high antiquity; they profess the religion of Brama; speak a dialect of the Sanscrit language, in which they have introduced all the technical terms of Moghul administration; use a character of their own in writing, though not very different from some of the other tribes around them; and are divided into four casts or classes of people, with the various subdivisions of professional distinction found over the rest of Hindostan, but with this remarkable difference, that among the Marhattas every individual may, as in fact he occasionally does, follow the life of a soldier.

As a nation inhabiting immemorially the country properly denominated *Marhat* or *Merhat*, and comprehending the greater part of the Paishwa's present dominion in the Decan, they were completely subjugated, and afterwards for many centuries depressed, first by the Patans, then by the Moghul conquerors of Delhi. At length, towards the end of Alemgeer's reign, they united, rebelled, and under the famous *Sewajee* or *Seeva-jee*, a leader of their own tribe, laid the foundations of their present vast empire, which has risen gradually on the ruins of the Mahomedan power, as related under the article HINDOSTAN, p. 531, par. 6.

Seeva-jee was succeeded by his son Rajah Sahou, who considerably extended the Marhatta dominions. When Rajah Sahou grew old and infirm, and the fatigues of government began to press heavy upon him, he appointed Biffonat Balajee, a Brahman born at Gokum, and leader of about 25,000 horse, to the office of Paishwa or vicegerent.

Rajah Sahou died without issue, but left nephews by his brother. The courage and wisdom of Balajee had gained him, during the latter years of the old Rajah, the affection and esteem of all the nation. But, under an appearance of modesty and self-denial, his prevailing passion was ambition; and the sentiments

Margate,
Marhattas.

Sketches relating to the
Hindoos,
vol. ii.
p. 286, &c.

Marhattas. of gratitude and loyalty were absorbed in the desire to command. He made use of the influence he had acquired under his benefactor so firmly to establish his own power, that he not only retained the high office of Paishwa during his life, but transmitted it to his posterity. The Marhattas, gradually forgetting a prince they knew nothing of, became accustomed to obey his vicegerent only : yet a certain respect for the royal race, or the dread of the consequence of violating the strong prejudice which the nation still retains in favour of the family of its founder, have served perhaps to preserve it ; and the descendants of Rajah Sahou's nephews yet exist, but are kept in captivity in the palace at Sattarah. The eldest is styled Ram Rajah, or sovereign ; his name is on the seal and coin of the Marhatta state ; but his person is unknown, except to those who immediately surround him. He resides in his splendid prison, encompassed with the appendages of eastern grandeur, but debarred of all power, and kept totally ignorant of business. The seat of government was transferred from the ancient royal residence of Sattarah to Poonah ; and the usurper, as well as his successors, seem still to have acted under the supposed authority of the deposed prince, by their assuming no other title or character than that of Paishwa or prime-minister. From this change, the empire of the Ram-Rajah has been distinguished only by the appellation of the *Paishwasship*, or otherwise the *Government of Poonah*, from the name of its present capital.

Bissonat Balajee was succeeded as Paishwa by his eldest son Balajee Row (called also *Nana Sahib*, or *Nanah Row*), who left three sons, the eldest of whom, Balajee Pundit, sometimes called Nanah Pundit, succeeded him. The two others were Rogobah or Ragonat Row, and Shamsheer Row.

Balajee Pundit left two sons ; Mahadava Row, who was Paishwa twelve years ; and Narrain Row, who succeeded him.

During the latter part of the life of Mahadava Row, his uncle Rogobah was confined to the palace at Poonah, for reasons with which we are not acquainted. Mahadava Row died without issue ; and upon the accession of Narrain his brother, a youth of about 19 years of age, Rogobah in vain applied to be released from his confinement. He is therefore suspected of having entered into a conspiracy with two officers in his nephew's service, Somair Jing and Yufuph Gardie, in order to procure that by force which he could not obtain by intreaty. The correspondence between the conspirators was carried on with so much secrecy, that the court had not the least intimation or suspicion of their design, till every avenue leading to the palace had been secured, and the whole building surrounded by the troops under the command of those two officers. It is said, that on the first alarm, Narrain Row, suspecting his uncle, ran to his apartment, threw himself at his feet, and implored his protection : " You are my uncle (said he), spare the blood of your own family, and take possession of a government which I am willing to resign to you."

Somair and Yufuph entered the room whilst the young Paishwa was in this suppliant posture. Rogobah, with apparent surprise and anger, ordered them

to withdraw ; but as they either knew him not to be sincere, or thought they had proceeded too far to retreat, they stabbed Narrain with their poignards whilst he clung to his uncle's knees.

The office of Paishwa being now vacant, the chiefs of the nation then at Poonah were assembled, and Rogobah being the only survivor of the family of Bissonat Balajee, to whose memory the Marhattas in those parts are enthusiastically attached, he was named to fill it. Being naturally of a warlike temper, he resolved to undertake some foreign expedition ; for besides gratifying his passion for the field, he probably hoped, by the splendour of his exploits, to draw off the attention of the public from inquiring into the late catastrophe.

A pretence for war was not difficult to be found. He renewed the claim of his nation to the *chout*, and marched his army towards Hydrobad, the capital of the Nizam. The vigour of his measures procured him an accommodation of his demand ; and he was proceeding to enforce a similar one upon the Carnatic, when he received intelligence which obliged him to return hastily to Poonah.

Although the Marhatta chiefs had acknowledged Rogobah as Paishwa, yet they and the people in general were much dissatisfied with his conduct. The murderers of Narrain Row had not only escaped punishment, but, as was reported, had been rewarded. The crime was unexampled, and the perpetrators were beheld with uncommon horror and detestation. The Paishwa had hitherto so fully possessed the love of the people, that, till then, guards were considered as unnecessary about the person of a man whose character rendered him inviolable. Every one therefore had free access to his palace, and he relied with confidence for his safety upon the affections of those who approached him.

These reflections operated powerfully upon the minds of the Marhattas ; but perhaps no violent consequences would have ensued, had it not been discovered, soon after the departure of Rogobah from Poonah, that the widow of Narrain Row, Ganga Bae, was pregnant. This determined their wavering resolutions. Frequent consultations were held among the principal men then in the capital ; and it was finally resolved to abjure the allegiance they had sworn to Rogobah, and declare the child, yet unborn, to be the legal successor of the late Paishwa.

A council of regency was immediately appointed to govern the country until the child should become of age ; and it was agreed to reserve their deliberations, in case it should prove a female or die, till the event should render them necessary. The ywho principally conducted these measures, and whose names will on that account be remembered, were Sackharam Babou and Balajee Pundit, called also Nanah Pher Nevees from his having been long the principal secretary of the Marhatta state. Nine other Marhatta leaders approved of these measures, and swore to maintain them.

As the first step towards the execution of their plan, the widow of Narrain Row was conveyed to Poorender, a fort of great strength, situated on a high mountain, about 25 miles from Poonah. As soon as Rogobah received intimation of this revolution, he march-

Marhattas. ed back towards the capital. But discontent had already infected his troops; some of the chiefs retired to their estates, and others joined the standard of the regents. He however risked a battle with an army of the revolted commanded by Trimbec Row, in which the latter was slain; but though he obtained a victory, the strength of the confederates daily increased, while his own troops were diminished by continual desertions. He therefore found it necessary to retire to Ugein, and to solicit the assistance of the Marhatta chiefs Sindia and Holkar; but meeting with a refusal, he went to Surat, and applied for succour to the English.

Rogobah's success in this application was the cause of two wars with the Marhatta state; which, after much waste of blood and treasure, we were obliged to conclude by relinquishing his claim, and acknowledging as legal Paishwa the son of Narrain Row, who was born about seven months after the death of his father. See INDIA, n° 121 and 152; also HINDOSTAN, n° 21.

The Marhatta dominions, as already observed, are governed by a number of separate chiefs, all of whom acknowledge the Ram Rajah as their sovereign; and all, except Moodajee Boonsalah, own the Paishwa as his vicegerent. The country immediately subject to the Paishwa, including all the hereditary territories that were left by the Rajah Sahou to the Ram Rajah, and those that have been acquired and added to them since in his name, extends along the coast nearly from Goa to Cambay; on the south it borders on the possessions of Tippoo Saib, eastward on those of the Nizam and of the Marhatta Rajah of Berar, and towards the north on those of the Marhatta chiefs Sindia and Holkar.

Moodajee Boonsalah, Rajah of Berar, possesses, besides Berar, the greatest part of Orixia (see HINDOSTAN, p. 532, par. 6.). This prince being descended from the line of the Ram Rajah, eyes the power of the Paishwa, by whom a branch of his family is kept in ignominious confinement, with ill-will; has often refused to support his measures; and, on some occasions, has even seemed inclined to act against him.

Next to Moodajee, in point of importance, must be ranked Madajee Sindia, a bold and aspiring chief, who possesses the greatest part of the extensive soubadary or government of Malva, together with part of the province of Candeish. The remainder is under the dominion of Holkar. Both he and Sindia pretend to be descended from the ancient kings of Malva. Sindia resides chiefly at Ugein, near the city of Mundu, once the capital of these kings; and Holkar at Indoor, a town little more than 30 miles west of it. The dominions of these, and of some chiefs of less consequence, extend as far as the river Jumna.

The measures pursued by the Marhattas for some years left little room to doubt that they aspired at the sovereignty of all Hindostan, or at least at the expulsion of the Mahomedan princes: And in this last de-

† *An Historical and Political View of the Decan.* sign they appear to have succeeded†, and to have gained a great accession of territory, through the arms of Sindia, both by the capture of the cities of Agra and Delhi, with their territorial dependencies, and the consequent captivity of the unfortunate monarch who ruled

there as the last imperial representative of the great Moghul race of Timur. "The whole of the dominion thus newly established is of vast extent, stretching near 1200 miles along the frontiers of Tippoo and the Nizam in a north-east direction, from Goa on the Malabar coast to Balasore in Orissa adjoining to Bengal; and from thence north-westerly 1000 miles more, touching the confines of the British and allied states, on the borders of the Ganges and Jumna, to the territory of the Sieks at Paniput, rendered famous in 1761 for the last memorable defeat sustained by the Marhattas in their ambitious contest for empire with the united declining power of the Mahomedans. From this place, in a southerly course, with great encroachment on the old eastern boundary of the Rajepoot country of Ajmere, it runs about 260 miles to the little Hindoo principality of Kotta, and thence south-westerly 540 miles further to the extreme point of the soubah of Gujerat at Duarka, including the whole of that fertile province; from whence, along the sea-coasts of Cambay and Malabar to Goa, the distance may be reckoned 800 miles. Thus the overgrown empire of the Marhattas may be said to extend east 19 degrees of longitude, near the parallel of 22 degrees north latitude, from the mouths of the Indus to those of the Ganges, and about 13 degrees of latitude north, from the Kistnah to Paniput; comprehending at least an area of 400,000 square geographic miles, being considerably more than a third part of Hindostan, including the Decan, and equal perhaps in dimensions to all the British and allied states in India, with those of Golconda and Mysore, taken together."

MARIA, or SANCTA MARIA, an island of the Indian Ocean, lying about five miles east from Madagascar. It is about 27 miles long and five broad; well watered, and surrounded by rocks. The air is extremely moist, for it rains almost every day. It is inhabited by 500 or 600 negroes, but seldom visited by ships.

MARIA (St), a considerable town of South America, in the audience of Panama, built by the Spaniards after they had discovered the gold mines near it, and soon after taken by the English. It is seated at the bottom of the Gulf of St Michael, at the mouth of a river of the same name; which is navigable, and the largest that falls into the gulf. The Spaniards come here every year in the dry season, which continues three months, to gather the gold-dust out of the sands of the neighbouring streams; and carry away great quantities. W. Long. 148. 30. N. Lat. 7. 0.

MARIA (St), a handsome and considerable town of Spain, in Andalusia, with a small castle. It was taken by the English and Dutch in 1702, for the archduke of Austria. It is seated on the Guadaleta, at the mouth of which is a tower and a close battery. W. Long. 5. 33. N. Lat. 36. 35.

MARIAN ISLANDS. See LADRONE Islands.

MARIANA (John), a learned Spanish historian, born at Talavera in the diocese of Toledo. He entered among the Jesuits in 1554, at 17 years of age; and became one of the most learned men of his time. He was a great divine, a good humanist, and profoundly versed in ecclesiastical as well as profane history. He taught

Maria
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Mariana.

Marianus
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Marigalante.

taught at Rome, in Sicily, at Paris, and in Spain; and died at Toledo in 1624. His principal works are, 1. An excellent history of Spain in 30 books; which he himself translated from the Latin into Spanish, without servilely following his own Latin edition. 2. *Scholia*, or short notes on the Bible. 3. A treatise on the changes the specie has undergone in Spain; for which he was thrown into prison by the duke of Lerma, the Spanish minister. 4. A famous treatise *De rege et regis institutione*, which made much noise, and was condemned by the parliament of Paris to be burnt by the hands of the common hangman, for his asserting in that work, that it is lawful to murder tyrants. 5. A work on the faults of the government of the society of Jesuits, which has been translated into Spanish, Latin, Italian, French, &c.

MARIANUS SCOTUS, an Irish monk, was related to the Venerable Bede, and wrote a chronicle which is esteemed. He died in the abbey of Fuld in 1086, aged 58.

MARIBONE, or ST MARY LE BONE, or rather *Borne*, from the neighbouring brook, a parish of Middlesex, on the north-west side of London. The manor appears to have belonged anciently to the bishop of London. The houses in this parish are very numerous, comprising several extensive streets and squares, which are every year increasing. The Paddington road from Islington passes through this parish, which gives it communication with the eastern part of London without passing thro' the streets. Here were three conduits erected about the year 1238, for supplying the city of London with water; but anno 1703, when it was plentifully served by the New-River, the citizens let them out at 700l. a-year for 43 years. There were two for receiving its water at the north-east corner of the bridge on the river Tyburn, and over them stood the lord-mayor's banqueting-house, to which (the use of coaches being not then known) his lordship and the aldermen used to ride on horseback, as their ladies did in waggons. This banqueting-house, after being many years neglected, was taken down in 1737, and the cisterns arched over. This village, if it may be called by that name, is joined by new buildings to London. The old church, which was a mean edifice, was pulled down, and a new one erected in 1741. Besides which it has a great number of chapels of every sect and persuasion, and an extensive work-house for the poor.

MARIDUNUM (anc. geog.), a town of the Demetæ in Britain. Now *Caer Mardin*, or *Caermarthen*, the capital of Caermarthenshire.

MARIGALANTE, an island of North America, and one of the least of the Caribbees, lies in N. Lat. 16. 32. and W. Long. 61. 5. from London, at the distance of four leagues from Guadaloupe, to the south. The soil, produce, and climate, are pretty much the same as the other Caribbees. Columbus discovered it on his second American voyage in 1483, and called it by the name of his ship *Maria Galanta*, or *Gallant Mary*. It is about six leagues long, and between three and four broad. Viewed at a distance from on board a ship, it appears like a floating island, because, as it is for the most part flat, the trees seem to swim; but a nearer prospect shows it to be intersected by some rising grounds, which give a fine variety to the landscape. The French settled here in 1648; and it

was taken by the English in 1691, but the French soon got possession of it again. It was again taken by the British in 1759, but afterwards restored at the peace 1763.—This island was thought, on its first discovery, to want water; but a charming running stream has in time been discovered, no less convenient than refreshing and wholesome, on the banks of which are some wealthy planters, and excellent plantations of sugar. A little village in a small bay is the capital of the island, and here the commandant resides. The whole island is very capable of improvement; the soil being almost equally good, and the land rising nowhere too high. The coast affords many little bays, and safe anchorage and shelter to ships.

MARINE, a general name for the navy of a kingdom or state; as also the whole economy of naval affairs; or whatever respects the building, rigging, arming, equipping, navigating, and fighting ships. It comprehends also the government of naval armaments, and the state of all the persons employed therein, whether civil or military.

The history of the marine affairs of any one state is a very comprehensive subject, much more than of all nations. Those who would be informed of the maritime affairs of Great Britain, and the figure it has made at sea in all ages, may find abundance of curious matter in Selden's *Mare Clausum*; and from his time to ours, we may trace a series of facts in Lediard's and Burchet's *Naval History*, but above all in the *Lives of the Admirals*, by the accurate and judicious Dr Campbell.

MARINES, or *MARINE Forces*, a body of soldiers raised for the sea-service, and trained to fight either in a naval engagement or in an action ashore.

The great service of this useful corps was manifested frequently in the course of the war before last, particularly at the siege of Belleisle, where they acquired a great character, although lately raised and hardly exercised in military discipline. At sea they are incorporated with the ship's crew, of which they make a part; and many of them learn in a short time to be excellent seamen, to which their officers are ordered by the admiralty to encourage them, although no sea-officer is to order them to go aloft against their inclination. In a sea-fight their small-arms are of very great advantage in scouring the decks of the enemy; and when they have been long enough at sea to stand firm when the ship rocks, they must be infinitely preferable to seamen if the enemy attempts to board, by raising a battalion with their fixed bayonets to oppose him.

The sole direction of the corps of marines is vested in the lords commissioners of the admiralty; and in the admiralty is a distinct apartment for this purpose. The secretary to the admiralty is likewise secretary to the marines, for which he has a salary of L. 300 a-year; and he has under him several clerks for the management of this department.

The marine forces of Great Britain in the time of peace are stationed in three divisions; one of which is quartered at Chatham, one at Portsmouth, and another at Plymouth. By a late regulation, they are ordered to do duty at the several dock-yards of those ports, to prevent embezzlement of the king's stores, for which a captain's guard mounts every day; which certainly requires great vigilance, as so many abuses of this kind have

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have been committed, that many of the inhabitants, who have been long used to an infamous traffic of this kind, expect these conveyances at certain periods as their due, and of course resent this regulation in the highest degree as an infringement of their liberties as British subjects.

The marine corps are under the command of their own field-officers, who discipline them, and regulate their different duties.—His late majesty in 1760 formed a new establishment of marine officers, intitled, the *general, lieutenant-general, and three colonels* of marines (one for each division), to be taken from officers in the royal navy. The two first are always enjoyed by flag-officers, the last by post-captains only. This establishment was formed to reward such officers who distinguished themselves in the service of their country.

MARINE-Discipline, is the training up soldiers for sea-service, in such exercises as the various positions of the firelock and body, and teaching them every manœuvre that can be performed on board ships of war at sea. See EXERCISE.

MARINE-Chair, a machine invented by Mr Irwin for viewing the satellites of Jupiter at sea, and of course determining the longitude by their eclipses. An account of it is given in the *Journal Estranger* for March 1760. An account of its accuracy was published the year following by M. de L'Isle astronomer in the imperial academy of Petersburg: but notwithstanding the encomiums bestowed upon it by this gentleman, it hath never come into general use; and therefore we may conclude, that it is much inferior to the inventions of Mr Harrison for the same purpose. See HARRISON and LONGITUDE.

MARINE-Surveyor, is the name of a machine contrived by Mr H. de Saumarez for measuring the way of a ship in the sea. This machine is in the form of the letter Y, and is made of iron or any other metal. At each end of the lines which constitute the angle or upper part of that letter, are two pallets, not much unlike the figure of the log; one of which falls in the same proportion as the other rises. The falling or pendant pallet meeting a resistance from the water, as the ship moves, has by that means a circular motion under water, which is faster or slower according as the vessel moves. This motion is communicated to a dial within the ship, by means of a rope fastened to the tail of the Y, and carried to the dial. The motion being thus communicated to the dial, which has a bell in it, it strikes exactly the number of geometrical paces, miles, or leagues, which the ship has run. Thus the ship's distance is attained; and the forces of tides and currents may also be discovered by this instrument: which, however, has been very little used.

MARINE-Acid, a name given to one of the component parts of sea-salt. An account of various methods of procuring this acid from common salt, of most of its chemical properties, and of several uses it may be put to in the arts, is given under the articles CHEMISTRY, COLOUR-Making, BLEACHING, &c. M. Chaptal observes, that the marine acid cannot be obtained by distilling salt with powdered flints. He made the experiment by mixing ten pounds of flints with two pounds of sea-salt, but obtained only a mass of the colour of litharge, and the fumes were not perceptibly acid. Clay will decompose this salt for once, but not

in the smallest degree if used a second time; which shows that in all probability the decomposition is owing to a portion of vitriolic acid contained in the clay. In France there is a very impure kind of soda named *Blanquette*, which, according to M. Chaptal's analysis, contains 21 pounds of sea-salt out of 25; and yet, when treated with vitriolic acid, affords little or no spirit of salt, but abundance of volatile spirit of sulphur. Our author ascribes this to the quantity of charcoal contained in the *blanquette*, which unites with the vitriolic acid and volatilizes it: and his conjectures appeared to be right; because, if the coal is destroyed by calcination, the *blanquette* yields marine acid in proportion to the quantity of common salt it contains.

Under the article BLEACHING we have taken notice of the properties of the dephlogisticated acid of sea-salt in whitening cloth: but though this has been often attempted, it does not appear likely to come into practice; nor does even the offer of a premium seem to encourage the bleachers of this country to make any serious endeavour to introduce it. This we can only account for in two ways: 1. From the very noxious and suffocating smell attending the operation, by which the health, and even the life of those who prepare this acid in an unskilful manner, as well as of the bleachers who make use of it, are greatly endangered. 2. From the excessive waste of vapour in the ordinary mode of preparation, which renders the liquid too dear for ordinary use.

To avoid these inconveniences, it has been recommended by chemists to force the vapour violently into larger quantities of water, and by compressing the fumes to a great degree, to render the liquid extremely strong, and then dilute it when it is to be used. By this means, however, the vapour forces out at the joinings of the distilling vessel in such a manner that no lute can keep it in; at the same time that the liquor being impregnated with an over-proportion of gas, lets go the superfluous quantity as soon as the pressure is taken off, thereby losing its power, and annoying with its noxious and indeed poisonous smell every one who comes near it. The trouble attending this preparation may be easily judged from the following description of the process given by M. Chaptal.

“To extract this acid (says he), I place a large glass alembic, of one single piece, upon a sand-bath. To the alembic I adopt a small receiver; and to the receiver three or four small bottles nearly filled with distilled water, and arranged according to the method of Mr Woulfe. I dispose the receiver and bottles in a cistern, the places of junction being luted with fat lute, and secured with rags soaked in the lute of lime and whites of eggs. Lastly, I surround the bottles with pounded ice. When the apparatus is thus disposed, I introduce into the alembic half a pound of manganese of Cevennes, and pour upon it, at several repetitions, three pounds of fuming muriatic acid. The quantity of acid which I pour at once is three ounces; and at each time of pouring, a considerable effervescence is raised. I do not pour a new quantity until nothing more comes over into the receivers. This method of proceeding is indispensably necessary when the operator is desirous of making his process with a definite quantity of materials: for if too large a quantity

Marine-
acid.

tity of acid be poured on at once, it is impossible to restrain the vapours; and the effervescence will throw a quantity of manganese into the receiver. The vapours which are developed by the effusion of muriatic acid are of a greenish-yellow colour, and they communicate this colour to the water when they combine with it. When this vapour is concentrated by means of the ice, and the water is saturated with it, it forms a scum on the surface, which is precipitated through the liquid, and resembles a congealed oil. It is necessary to assist the action of the muriatic acid by means of a moderate heat applied to the sand-bath. The secure luting of the vessels is also an essential circumstance; for the vapour which might escape is suffocating, and would not suffer the chemist to inspect his operation closely. It is easy to discover the place where it escapes through the lutes by running a feather dipped in volatile alkali over them; the combination of these vapours instantly forms a white cloud, which renders the place visible where the vapour escapes.

"The same oxygenated muriatic acid may be obtained, by distilling in a similar apparatus ten pounds of marine salt, three or four pounds of manganese, and ten pounds of *fulphuric* (vitriolic) acid.

"Mr Reboul has observed, that the concrete state of this acid is a crystallization of it, which takes place at three degrees of temperature below the freezing point of Reaumur. The forms which have been observed are those of a quadrangular prism, truncated very obliquely, and terminated by a lozenge. He has likewise observed hollow hexahedral pyramids on the surface of the liquor.

"To make use of the oxygenated acid in the arts, and in order to concentrate a greater quantity in a given volume of water, the vapour is made to pass thro' a solution of alkaline salt. A white precipitate is at first formed in the liquid; but a short time afterwards the deposition diminishes, and bubbles are disengaged which are nothing but the carbonic acid. In this case two salts are formed, the oxygenated muriate and the ordinary muriate. The mere impression of light is sufficient to decompose the former, and to convert it into common salt. This lixivium contains indeed the oxygenated acid in a stronger proportion. The execrable smell of the acid is much weakened. It may be employed for various uses with the same success, and with great facility; but the effect is very far from corresponding with the quantity of oxygenated acid which enters into this combination, because the virtue of a great part is destroyed by its union with the alkaline basis.—The oxygenated muriatic acid has an excessively strong smell. It acts directly on the larynx, which it stimulates, excites coughing, and produces violent headaches."

The apparatus recommended by Mr Berthollet is on the same plan with M. Chaptal's, though the scale is much larger. Both are evidently troublesome; and cannot by any means be introduced into ordinary practice, where the *preparation*, as well as the method of using the liquor, must be left to workmen of little understanding and less attention. For these it is necessary to have an apparatus which may not readily be broken, which requires little trouble or dexterity in the using, and which may prepare great quantities at once. The principal difficulty is the condensation of the

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fumes. To attempt violently to force steam of any kind into water is always improper, and seldom answers any purpose, unless when for chemical experiments the liquors are wanted of extraordinary strength. Water naturally attracts a certain proportion of every kind of vapour; and when once this natural attraction is satisfied, it is vain to attempt to force more into it. In proportion to the quantity of surface exposed to the steam, water will imbibe it in shorter or longer time; and therefore a broad shallow vessel is always preferable to a round or narrow deep one where distillations of this kind are to be performed.

It must also be observed, that the vapour with which the water is to be impregnated, ought not to rush out of the distilling vessel with too great haste; as in this case a great quantity will unavoidably be lost, by reason of the water not having time to absorb it all. To avoid this, matters should be managed in such a manner, that, without sensibly interrupting the operation, the vapour may issue from the distilling vessel gradually, and without sudden explosions; by which means the water will imbibe as fast as the vessel distils for a certain time; and in order to preserve all the vapour, there ought to be several receivers, one above the other, communicating by pipes, that the vapour which does not condense in one may do so in the other.—The following apparatus may be used with success:

1. For the distilling-vessel. A large bottle of common brown earthen-ware, such as is represented on the margin, is undoubtedly the cheapest, and most eligible distilling-vessel that can be made use of; as it is not liable to break, and may be used for a long time without being corroded. It may be placed in a sand-bath; or in case it is luted, it may be put on an open fire, which, however, ought not to be raised to any great height.



2. The receivers ought to be large square cisterns of wood, covered over on the inside with white wax, on which the acid has no effect; and they may be placed, for the greater convenience, one above the other, with cocks so situated, that the water of the upper cisterns may be discharged into the lower ones as occasion requires. The lowermost cistern must also be furnished with a cock, for running off the liquor into the vessels in which the cloth is to be steeped.

3. The bottle must be furnished with a glass tube to convey the steam from it into the receiver; but to prevent any of the acid from getting in amongst the liquor designed for bleaching, it will be necessary to have a small cask interposed betwixt it and the receivers; which will also prevent the liquor from being dirtied by any sudden swell of the mixture in the bottle.

4. It will be convenient, and which may be easily accomplished in most bleaching-houses, to have a small stream of clear water running into it, higher than the level of the uppermost reservoir; by which means they can all be filled to a sufficient depth with very little trouble. The apparatus then will be as represented on Plate CCLXXX. where A is the bottle containing the mixture; B the sand pot, furnace, door, and ash-hole; C the glass tube to convey the steam into the

Marine-
acid.

Marine-
Acid.

Marine.

cask D, placed there on purpose to catch any acid which may distil, or small quantity of the mixture which may boil over. E is another glass-tube communicating with the lowermost reservoir *d*, into which it conveys the steam to be absorbed by the water lying in its bottom. The three cisterns communicate on their upper parts by means of the pipes *m* and *n*, by which the steam which does not condense in the lower reservoir is conveyed to the middle one *e*, and that which does not condense in the middle one is conveyed to the upper one *f*; in which a vent is finally given to it at *g*; or if it is found that three reservoirs are not sufficient, there may be one or more placed on the top of these, in a manner similar to what we have already described.

The operation is to be begun by putting into the bottle A, a quantity of strong spirit of salt diluted with at least four times its quantity of water, sufficient to fill somewhat more than one half of it. The manganese, reduced to as fine a powder as possible, is to be made up into small pellets or balls, with water, and thrown in at the lateral neck of the bottle. A few only are to be thrown in at once, and the mouth instantly stopped with a cork; a brisk effervescence will immediately ensue, and a considerable quantity of vapours will come over without heat, passing thro' the pipes C and E into the reservoir *d*; from thence through *m* into the reservoir *e*, and from *e* into *f*; the small quantity which still remains uncondensed passing out at the vent *g*, which ought to be under a chimney, or to be fitted with an upright pipe going through the roof of the house.

A fire being applied, the vapour will begin to issue out through the pipes in greater quantities, but by the time the liquor has begun to boil, the dephlogisticated vapour will have entirely passed over. This may be easily known to be the case by the heat of the glass tubes. On this the cork is to be pulled out, and two or three more pellets of manganese are to be thrown in, and the mouth stopped up as quickly as possible. The vapour from these will be quickly dissipated, and the operation must be repeated until no more effervescence arises upon throwing in the manganese. When this is the case, a fresh quantity of spirit of salt diluted, but not so much as the preceding, is to be added, and this again treated with more manganese as before; continuing the operation till the bottle be supposed as full as is convenient for the operation. The whole must now be allowed to cool; and it would be proper to have another furnace, sand pot, and bottle, to join immediately to the reservoirs, that the operation may not be interrupted.—The water in the lowermost reservoir will always be most strongly impregnated, and may be known to be of sufficient strength when a few threads of flax put into it are visibly whitened in two or three minutes. It is then to be let off into the large reservoir for steeping the cloth; the water in the middle receiver, which is also partly impregnated with dephlogisticated gas, must be let down into the lowermost one by turning the cock of the pipe *i*, which runs off the water to the bottom. In like manner, the water in the upper cistern *f* is let down into the middle cistern *e*, by turning the cock belonging to the pipe *b*, while that in *f* is to be replaced by fresh water from the stream which runs into

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the house.—The residuum of the distillation is a solution of manganese in common spirit of salt, from which the metal may be precipitated by caustic volatile alkali, and the liquid will afford sal ammoniac: the precipitate, by being calcined again till it grows black, may be used as fresh manganese; but considering the low price of this mineral, we can scarce recommend this process as worth the trouble. It is certain, however, that a great part of the marine-acid will remain undecomposed, even after we have added as much manganese as will excite any effervescence. This may be extemporaneously recovered by pouring into the distilling vessel a small quantity of oil of vitriol. This expels the marine acid from the manganese with which it is united, and renders it again capable of acting upon more; but when the addition of a small quantity of this acid has no effect in producing the proper gas, we may then be sure that the operation is totally finished. The residuum is now a combination of manganese with vitriolic acid, and may be decomposed by volatile alkali, so that it can still be of use to the makers of spirit of hart's-horn and sal ammoniac.

Thus we see, that by a very easy process, without the smallest danger to the health of the workman, an unlimited quantity of dephlogisticated spirit of salt may be prepared of a sufficient strength to answer every useful purpose; and it is evident from the foregoing description of the process, that the most is made of the materials, so that we can scarce expect a cheaper method. The practice of mixing together the salt, oil of vitriol, and manganese, all together in the distilling vessel, is by no means to be commended; for thus the matter always runs into an hard lump, which cannot be got out without breaking the vessel; and the vapour is, besides, forced out with such rapidity, that great part of it is unavoidably lost.

The next and most important consideration is the method of using the liquor after it is distilled. And here, as the volatility of the gas is the principal obstacle to the preservation of its strength, it is indispensibly necessary to have it to run from a covered spout into a covered vessel where the cloth is placed. It is likewise a matter of importance to have the cloth spread among the liquid in such a manner that the power of the gas may be equally diffused over its whole surface; for if it lies in folds upon one another, it will undoubtedly be spotted, let us do as we will. To prevent this in the most effectual manner, it is necessary to roll the cloth as is done by dyers to make their colours strike equally; for this operation we may account a kind of dyeing *white*; and the same precautions are undoubtedly necessary to make this colour equal as any other. It is probable, that vessels and rollers might be so constructed, that a number of pieces of cloth might be whitened all at once; and the operation of driving the rollers might be performed by a machine driven by water.

With regard to the use of this liquid itself, it must be observed, that though very cheap when made as above directed, yet water itself is still cheaper; and whatever can be done by mere water, ought to be previously done to the cloth before it is immersed in the dephlogisticated liquor. With this view it ought to undergo a long continued but gentle fulling, a stream

Marine-
Acid.

of warm water constantly running upon it all the while. Thus an incredible quantity of filth will be separated; and it will be matter of surprise to those who have not made the experiment, to be told, that they could not, in 24 hours, wash a piece of cloth as it comes from the weaver so clean in repeated quantities of water but that it would still render the last quantity dirty. Cloth, when treated in this manner for a considerable time, will be very nearly as well whitened as that which has been boiled in alkali. Boiling in water has not an effect nearly equal to that of gentle beating while the cloth is immersed in water, neither are violent strokes so useful as those which are gentle; and it might undoubtedly be worth while to contrive a machine for the purpose of giving this gentle fulling, which, without injuring the texture of the cloth, might be continued for a long time, and would be advantageous either on the old or new plan of bleaching.

If this method of fulling should not be adopted, that of *streaming* the cloth, or immersing it for some time in a stream of running water, would be of very considerable use as a preparation: but boiling with alkaline salt seems more advantageously to be omitted till after the cloth has undergone two or three operations in the dephlogisticated liquor; because this liquid, even when very weak, will cleanse considerably, and extract a great quantity of fordes, which would load the alkali and destroy its force.

Having prepared the cloth in some of the methods above mentioned, it is to be put into the vessel designed for whitening, put over the roller, and a quantity of the liquid let into it. As the cloth whitens, the liquor gradually loses its smell, and soon becomes incapable of giving any additional whiteness. This may be perceived by having a small door in the side of the vessel, which may be opened occasionally, and a bit of the cloth pulled out through it and looked at. When the first quantity of liquid, therefore, appears to have no more effect, it must be allowed to run off into another vessel; but is not yet to be thrown away, because it is still much more powerful than water, and will have a considerable effect upon cloths which have undergone the aqueous preparation.

After the first quantity of liquid is run off, another must be admitted from the lowermost reservoir, and is to be used in the same manner with the former; only it will now be somewhat longer before its strength is exhausted. When this is the case, a third quantity is to be employed, and so on till we find that the effect of the liquid is beginning to diminish. The cloth must then be taken out, fulling, and thoroughly cleaned of the acid by water, before the next operation, which is boiling with alkali. The lixivium ought to be of considerable strength, that the liquor may easily be evaporated, and part of the alkali recovered by a process related under the article POTASHES; but as the cloth will necessarily retain a considerable quantity of this strong lixivium, it must be wrung out by a proper instrument for that purpose, and the liquid which falls from it saved and returned again into the kettle. The cloth, still retaining a quantity of alkali which could not be wrung out, must be thrown into a cauldron of boiling water, and allowed to remain there for a quarter of an hour; after which it is to be taken out and wrung as before. The water of the second

cauldron will be slightly alkaline, and may be used as a preparation for cloth, or for filling up the vessel containing the strong alkali as it evaporates.

Before the cloth is returned into the dephlogisticated liquor, it is absolutely necessary that the alkaline salt be entirely taken out of it, which can only be speedily done by fulling, streaming, or at least steeping in repeated quantities of water. When all this is done, it will most probably be of a darker colour than before; but this will go off in a few minutes, and the cloth will become much whiter than ever. The remainder of the operation is only a repetition of the processes already described, and for which no other directions are requisite than that both alkali and acid, the latter especially, always loosen a quantity of fordes, which, unless washed off, soon prevents their own operation. As soon, therefore, as the cloth is taken out of either the alkaline or acid liquor, there is a necessity for using every method consistent with the safety of its texture to clear it of this loose matter, which will allow the liquor into which it is next plunged to have the greater effect. It must be remembered, however, that the nearer the cloth approaches to perfect whiteness, the less effect has either of the liquids upon it; and therefore there is a necessity either for increasing the strength of the dephlogisticated acid, or allowing it a longer time; but the latter is by much the preferable method: and, after all, it would be far from being improper to expose the cloth for a few days to the air, which will effectually prevent any change of colour afterwards, as frequently happens to cloths bleached after this manner.

Could a ready method be fallen upon to bleach flax by itself, it would be greatly in favour of the linen manufacture; as the strength of the threads are vastly increased by this method. The great difficulty in this operation; arises from the filamentous nature of the flax; by which, when put into any liquid, it becomes matted together in such a manner as not to be separated afterwards by any means whatever so as to be spun with the same ease as before. The fairer and better dressed the lint is, the greater is this difficulty; and to obviate it, there seems to be no other possible method but that of using flax just as it comes from the mill, without any other dressing. Thus, indeed, the tow must be bleached as well as the flax; but when we consider, that thus it may be spun into much finer and stronger yarn than otherwise could be done, we cannot suppose this to be any disadvantage.

Another obstacle is the difficulty the liquid has in getting into the heart of the flax; so that the outside will be well whitened, when the inside is scarce altered. For this no other remedy seems adequate, besides the dividing it into many small parcels, tying them together in pairs, putting them over rods as candle-makers do their candles, and thus suspending them for a time in the liquid. They must be dipped in an hot solution of alkali in the same manner, afterwards for a considerable time in fresh water, to take out all the alkali; after which, they are to be again put into the acid liquor, and treated exactly as directed for the cloth. Thus, in two or three days, the flax will attain a surprising whiteness. It is then to be dressed and treated exactly as other flax, but must be dried without any kind of wringing or pressure.

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sure.—This method would appear to be useful, even though the utmost degree of whiteness should not be given, as the texture of the threads will be much less injured by the subsequent bleaching than if the flax had been spun in its natural state.

Mr Chaptal observes, that this acid may be applied to the whitening of paper and old prints; and by its means (he says) they obtain a whiteness which they never had before. Common ink disappears by its action, but it has no effect upon printer's ink.—It thickens oils, and calcines metals to such a degree, that the process may be much expedited by its means. It dissolves metals without effervescence, and precipitates mercury from its solutions, converting it into corrosive sublimate.—It acts, likewise, very vigorously upon metallic calces, forming with them salts more readily than other acids.

M. Chaptal observes, that the combination of the marine acid with vegetable alkali, named *febrifuge salt of Sylvius*, is found, though in small quantities, in seawater, plaster, and the ashes of tobacco. "The existence of this salt (says he) in the ashes of tobacco, might with justice have surprised me, as I had reason to expect the muriate of soda, which is employed in the operation called *watering*. Was the soda metamorphosed into pot-ash by the vegetable fermentation? This may be determined by direct experiments."

MARINER, the same with a sailor or seamen. See these articles.

Method of preserving the health of MARINERS. See SEAMEN.

MARINER'S Compass. See COMPASS.

ST MARINO, a small town and republic of Italy, situated in E. Long. 13. 44. N. Lat. 44. 21. This small republic consists only of a mountain, and a few hillocks, that lie scattered about the bottom of it. The number of the inhabitants is about 5000. The mountain yields good wine, but they have no other than rain or snow water. The founder of the republic was a Dalmatian, and a mason, who upwards of 1300 years ago turned hermit, and retired to this mountain. Here his devotion and austerity, and, in consequence of that, his reputation for sanctity, were such, that the princes of the country made him a present of the mountain; on which many, out of veneration for the saint, soon after took up their abode. Thus was the foundation laid of the town and republic, which still bears the name of the saint. The town stands on the top of the mountain, and there is only one way by which it can be come at. In the whole territory are only three castles, three convents, and five churches. The largest of the churches is dedicated to the saint, and contains his ashes and his statue. He is looked upon as the greatest saint, next to the blessed Virgin; and to speak disrespectfully of him is accounted blasphemy, and punished as such. The republic is under the protection of the pope. All that are capable of bearing arms are exercised, and ready at a minute's call. In the ordinary course of government, the administration is in the hands of the council of 60, which, notwithstanding its name, consists only of 40; one half of the members of which are of the noble families, and the other of the plebeian: on extraordinary occasions, however, the *arengo*, in which every house has its representative, is

called together. The two principal officers are the capitaneos, who are chosen every half year; and next to them is the commissary, who judges in civil and criminal matters, and is joined in commission with the capitaneos; both he and the physician must be foreigners, and both have their salaries out of the public stock. When any person, after due summons, neglects to assist at the council according to their statute-book, he is to be fined in about a penny English; and when an ambassador is to be sent to any foreign state, he is to be allowed about 1s. a-day.

MARINO (John Baptist), a celebrated Italian poet, born at Naples in 1569. His father, who was an able civilian, obliged him to study the law; at which being disgusted, he left his parents, and retired to the house of the Sjeur Manzi, who was a friend to all persons of wit. He at length became secretary to Matthew of Capua, great admiral of the kingdom of Naples, and contracted a friendship with Tasso. A short time after, he went to Rome, and entered into the service of cardinal Aldobrandini, nephew to pope Clement VIII. who took him with him to Savoy. Marino was in great favour with the court of Turin; but afterwards created himself many enemies there, the most furious of whom was the poet Gaspard Murtola, who, attempting to shoot him with a pistol, wounded one of the duke of Savoy's favourites. Marino being obliged to leave Turin, went to Paris at the desire of queen Mary de Medicis, and published there his poem on Adonis. He afterwards went to Rome, where he was made prince of the academy of the humoristi; from thence to Naples, where he died while he was preparing to return home. He had a very lively imagination, but little judgment; and, giving way to the points and conceits then in vogue, his authority, far from correcting the false taste of the Italians, served rather to keep it farther from reformation. His works, which are numerous, have been often printed.

MARINUS, an engraver who flourished about the year 1630, and resided principally at Antwerp. His plates, Mr Strutt observes, are executed in a very singular style, with the graver only: The strokes are very fine and delicate, and crossed over each other in a lozenge-like form, which he filled up with thin, long dots. His prints, though generally very neat, want the style of the master in the determination of the folds of the draperies and the outline of the human figure; the extremities of which are heavy, and not marked with precision. Fine impressions from his best plates are, however, much sought after by collectors; those especially after Rubens and Joardens are held in very high estimation.

MARIONIS, (anc. geog.) a town of Germany: now Hamburg, a famous trading city on the Elbe, in Lower Saxony, in the duchy of Holstein. Another Marionis (Ptolemy), thought to be Wismar, a town of Lower Saxony, in the duchy of Mecklenburg.

MARIOTTE (Edme), an eminent physician and mathematician, was born in Burgundy, and was made a member of the academy of sciences. He died in 1684. His works, which are much esteemed, were printed at Leyden in 1717, 2 vols 4to.

MARJORAM, in botany. See ORIGANUM.

MARITAGIUM, in the feudal customs, *maritagium* (as contradistinguished from *matrimonium*), signifies

Maritime
Maritime
State.

fies the power which the lord or guardian in chivalry had of disposing of his infant ward in matrimony. For while the infant was in ward, the guardian had the power of tendering him or her a suitable match without disparagement or inequality: which if the infants refused, they forfeited the value of the marriage, *valorem maritagii*, to their guardian; that is, so much as a jury would assess, or any one would *bona fide* give to the guardian for such an alliance: and if the infants married themselves without the guardian's consent, they forfeited double the value, *duplicem valorem maritagii*.

MARITIME, something relating to, or bounded by, the sea. Thus a maritime province or country is one bounded by the sea; and a maritime kingdom is one that makes a considerable figure, or that is very powerful at sea. Hence, by *maritime* powers among the European states, are understood great Britain and Holland.

MARITIME State, in British polity, one of the three general divisions of the laity: (See LAITY). This state is nearly connected with the military; though much more agreeable to the principles of our free constitution. The royal navy of England hath ever been its greatest defence and ornament; it is its ancient and natural strength; the floating bulwark of the island; an army from which, however strong and powerful, no danger can ever be apprehended to liberty: and accordingly it has been assiduously cultivated from earliest ages. To so much perfection was our naval reputation arrived in the 12th century, that the code of maritime laws, which are called the *laws of Oleron*, and are received by all nations in Europe as the ground and substruction of all their marine constitutions, was confessedly compiled by our king Richard I. at the isle of Oleron on the coast of France, then part of the possessions of the crown of England. And yet so vastly inferior were our ancestors in this point to the present age, that even in the maritime reign of queen Elisabeth, Sir Edward Coke thinks it matter of boast, that the royal navy of England then consisted of *three and thirty* ships. The present condition of our marine is in great measure owing to the salutary provisions of the statutes called the *navigation acts*; whereby the constant increase of English shipping and seamen was not only encouraged, but rendered unavoidably necessary. By the statute 5 Richard II. c. 3. in order to augment the navy of England, then greatly diminished, it was ordained, that none of the king's liege people should ship any merchandize out of or into the realm, but only in ships of the king's ligeance, on pain of forfeiture. In the next year, by statute 6 Ric. II. c. 8. this wise provision was enervated, by only obliging the merchants to give English ships (if able and sufficient) the preference. But the most beneficial statute for the trade and commerce of these kingdoms is that navigation-act, the rudiments of which were first framed in 1650, with a narrow partial view; being intended to mortify our own sugar islands, which were disaffected to the parliament, and still held out for Charles II. by stopping the gainful trade which they then carried on with the Dutch, and at the same time to clip the wings of those our opulent and aspiring neighbours.

This prohibited all ships of foreign nations from trading with any English plantations, without licence from the council of state. In 1651, the prohibition was extended also to the mother-country: and no goods were suffered to be imported into England, or any of its dependencies, in any other than English bottoms; or in the ships of that European nation of which the merchandize imported was the genuine growth or manufacture. At the Restoration, the former provisions were continued, by stat. 12 Car. II. c. 18. with this very material improvement, that the master and three-fourths of the mariners shall also be English subjects.

Many laws have been made for the supply of the royal navy with seamen; for their regulation when on board; and to confer privileges and rewards on them during and after their service.

1. For their supply. The principal, but the most odious, though often necessary method for this purpose, is by impressing; see IMPRESSING. But there are other ways that tend to the increase of seamen, and manning the royal navy. Parishes may bind out poor boys apprentices to the masters of merchantmen, who shall be protected from impressing for the first three years; and if they are impressed afterwards, the masters shall be allowed their wages: great advantages in point of wages are given to volunteer seamen, in order to induce them to enter into his majesty's service: and every foreign seaman, who, during a war, shall serve two years in any man of war, merchantman, or privateer, is naturalized *ipso facto*. About the middle of king William's reign, a scheme was set on foot for a register of seamen to the number of 30,000, for a constant and regular supply of the king's fleet; with great privileges to the registered men; and, on the other hand, heavy penalties in case of their non-appearance when called for: but this registry, being judged to be rather a badge of slavery, was abolished by stat. 9 Ann. c. 21.

2. The method of ordering seamen in the royal fleet, and keeping up a regular discipline there, is directed by certain express rules, articles, and orders, first enacted by the authority of parliament soon after the Restoration; but since new-modelled and altered, after the peace of Aix-la-Chapelle, to remedy some defects which were of fatal consequence in conducting the preceding war. In these articles of the navy almost every possible offence is set down, and the punishment thereof annexed: in which respect the seamen have much the advantage over their brethren in the land-service; whose articles of war are not enacted by parliament, but framed from time to time at the pleasure of the crown. Yet from whence this distinction arose, and why the executive power, which is limited so properly with regard to the navy, should be so extensive with regard to the army, it is hard to assign a reason; unless it proceeded from the perpetual establishment of the navy, which rendered a permanent law for their regulation expedient, and the temporary duration of the army, which subsisted only from year to year, and might therefore with less danger be subjected to discretionary government. But, whatever was apprehended at the first formation of the mutiny-act, the regular renewal of our standing force at the entrance

Maritime
State.

Marius. entrance of every year has made this distinction idle. For, if from experience past, we may judge of future events, the army is now lastingly ingrafted into the British constitution; with this singularly fortunate circumstance, that any branch of the legislature may annually put an end to its legal existence, by refusing to concur in its continuance.

3. With regard to the privileges conferred on sailors, they are pretty much the same with those conferred on soldiers, with regard to relief, when maimed, or wounded, or superannuated, either by countyrates, or the royal hospital at Greenwich; with regard also to the exercise of trades, and the power of making nuncupative testaments: and, farther, no seaman aboard his majesty's ships can be arrested for any debt, unless the same be sworn to amount to at least twenty pounds; though, by the annual mutiny-acts, a soldier may be arrested for a debt which extends to half that value, but not to a less amount.

MARIUS, the famous Roman general, and seven times consul, who sullied his great military reputation by savage barbarities. He was born at Arpinum, of obscure and illiterate parents. He forsook the meaner occupations of the country for the camp; and signalized himself under Scipio, at the siege of Numantia. The Roman general saw the courage and intrepidity of young Marius, and foretold the æra of his future greatness. By his seditions and intrigues at Rome, while he exercised the inferior offices of the state, he rendered himself known; and his marriage with Julia, who was of the family of the Cæsars, contributed in some manner to raise him to consequence. He passed into Africa as lieutenant to the consul Metellus against Jugurtha; and after he had there ingratiated himself with the soldiers, and raised enemies to his friend and benefactor, he returned to Rome and canvassed for the consulship. The extravagant promises he made to the people, and his malevolent insinuations about the conduct of Metellus, proved successful. He was elected and appointed to finish the war against Jugurtha. He showed himself capable in every degree to succeed to Metellus. Jugurtha was defeated, and afterwards betrayed into the hands of the Romans by the perfidy of Bocchus. No sooner was Jugurtha conquered, than new honours and fresh trophies awaited Marius. The provinces of Rome were suddenly invaded by an army of 300,000 barbarians, and Marius was the only man whose activity and boldness could resist so powerful an enemy. He was elected consul, and sent against the Teutones. The war was prolonged, and Marius was a third and fourth time invested with the consulship. At last two engagements were fought, and not less than 200,000 of the barbarian forces of the Ambrones and Teutones were slain in the field of battle, and 90,000 made prisoners. The following year, A. U. C. 651, was also marked by a total overthrow of the Cimbri, another horde of barbarians; in which 140,060 were slaughtered by the Romans, and 60,000 taken prisoners. After such honourable victories, Marius with his colleague Catullus entered Rome in triumph; and for his eminent services he received the appellation of the *third founder of Rome*. He was elected consul a sixth time; and as his intrepidity had delivered his country from its foreign ene-

mies, he sought employment at home, and his restless ambition began to raise seditions, and to oppose the power of Sylla. This was the foundation of a civil war. Sylla refused to deliver up the command of his forces, with which he was empowered to prosecute the Mithridatic war; and he resolved to oppose in person the authors of a demand which he considered as arbitrary and improper. He advanced to Rome, and Marius was obliged to save his life by flight. The unfavourable winds prevented him from seeking a safer retreat in Africa, and he was left on the coast of Campania, where the emissaries of his enemy soon discovered him in a marsh, where he had plunged himself in the mud, and left only his mouth above the surface for respiration. He was violently dragged to the neighbouring town of Minturnæ; and the magistrates, all devoted to the interest of Sylla, passed sentence of immediate death on their magnanimous prisoner. A Gaul was commanded to cut off his head in the dungeon; but the stern countenance of Marius disarmed the courage of the executioner: and when he heard the exclamation of *Tunc, homo, audes occidere Caium Marium*, the dagger dropped from his hand. Such an uncommon adventure moved the compassion of the inhabitants of Minturnæ. They released Marius from prison; and favoured his escape to Africa, where he joined his son Marius, who had been arming the princes of that country in his cause. Marius landed near the walls of Carthage, and he received no small consolation at the sight of the venerable ruins of a once powerful city, which like himself had been exposed to calamity, and felt the cruel vicissitude of fortune. This place of his retreat was soon known; and the governor of Africa, to conciliate the favour of Sylla, compelled Marius to fly to a neighbouring island. He soon after learned that Cinna had embraced his cause at Rome, when the Roman senate had stripped him of his consular dignity, and bestowed it upon one of his enemies. This intelligence animated Marius; he set sail to assist his friend only at the head of 1000 men. His army, however, was soon increased, and he entered Rome like a conqueror. His enemies were inhumanly sacrificed to his fury; Rome was filled with blood; and he, who once had been called the father of his country, marched through the streets of the city, attended by a number of assassins, who immediately slaughtered all those whose salutations were not answered by their leader. Such were the signals for bloodshed. When Marius and Cinna had sufficiently gratified their resentment, they made themselves consuls; but Marius, already worn out with old age and infirmities, died sixteen days after he had been honoured with the consular dignity for the seventh time, A. U. C. 666. Such was the end of Marius, who rendered himself conspicuous by his victories and by his cruelty. As he was brought up in poverty and among peasants, it will not appear wonderful that he always betrayed rusticity in his behaviour, and despised in others those polished manners and that studied address which education had denied him. He hated the conversation of the learned only because he was illiterate; and if he appeared an example of sobriety and temperance, he owed these advantages to the years of obscurity which he passed at Arpinum. His countenance

Marius.

Marius
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Mark.

nance was stern, his voice firm and imperious, and his disposition untractable. He was in the 70th year of his age when he died; and Rome seemed to rejoice at the fall of a man whose ambition had proved so fatal to many of her citizens. His only qualifications were those of a great general; and with these he rendered himself the most illustrious and powerful of the Romans, because he was the only one whose ferocity seemed capable to oppose the barbarians of the north.

C. MARIUS, the son of the great Marius, was as cruel as his father, and shared his good and his adverse fortune. He made himself consul in the 25th year of his age, and murdered all the senators who opposed his ambitious views. He was defeated by Sylla, and fled to Præneste, where he killed himself.

MARIUS, (M. Aurelius), a native of Gaul; who, from the mean employment of a blacksmith, became one of the generals of Gallienus, and at last caused himself to be saluted emperor. Three days after this elevation, a man who had shared his poverty without partaking of his more prosperous fortune, publicly assassinated him, and he was killed by a sword which he himself had made in the time of his obscurity. Marius has been often celebrated for his great strength; and it is confidently reported, that he could stop, with one of his fingers only, the wheel of a chariot in its most rapid course.

MARIUS (Maximus), a Latin writer, who published an account of the Roman emperors from Trajan to Alexander, now lost. His compositions were entertaining, and executed with great exactness and fidelity. Some have accused him of inattention, and complain that his writings abounded with many fabulous and insignificant stories.

MARIVAUX (Peter Carlet de), a French writer in the dramatic way and in romance, was born of a good family at Paris in 1688. A fine understanding, well improved by education, distinguished him early. His first object was the theatre, where he met with the highest success in comic productions; and these, with the merit of his other works, procured him a place in the French academy. The great characteristic of both his comedies and romance was, to convey an useful moral under the veil of wit and sentiment: "My only object (says he) is to make men more just and more humane;" and he was as amiable in his life and conversation as he was in his writings. He died at Paris in 1763, aged 75. His works consist of, 1. *Pieces de Theatre*, 4 vols 12mo. 2. *Homere travesti*, 12mo; which is not supposed to have done much honour to his taste. 3. *Le Spectateur François*, 2 vols 12mo. 4. *Le Philosophe Indigent*, 12mo. 5. *Vie de Marianne*, 2 vols 12mo; one of the best romances in the French language. 6. *Le Paysan Parvenu*, 12mo. 7. *Pharfamon*; inferior to the former.

MARK (St.) was by birth a Jew, and descended of the tribe of Levi. He was converted by some of the apostles, probably by St Peter; to whom he was a constant companion in all his travels, supplying the place of an amanuensis and interpreter. He was by St Peter sent into Egypt, fixing his chief residence at Alexandria, and the places thereabout: where he was so successful in his ministry, that he converted multitudes both of men and women. He afterwards remo-

ved westward, towards the parts of Libya, going through the countries of Marmorica, Pentapolis, and others thereabouts; where, notwithstanding the barbarity and idolatry of the inhabitants, he planted the gospel. Upon his return to Alexandria, he ordered the affairs of that church, and there suffered martyrdom in the following manner. About Easter, at the time the solemnities of Serapis were celebrated, the idolatrous people, being excited to vindicate the honour of their deity, broke in upon St Mark, while he was performing divine service, and, binding him with cords, dragged him through the streets, and thrust him into prison, where in the night he had the comfort of a divine vision. Next day the enraged multitude used him in the same manner, till, his spirits failing, he expired under their hands. Some add, that they burnt his body, and that the Christians decently interred his bones and ashes near the place where he used to preach. This happened in the year of Christ 68. Some writers assert, that the remains of St Mark were afterwards, with great pomp, translated from Alexandria to Venice. However, he is the tutelar saint and patron of that republic, and has a very rich and stately church erected to his memory. This apostle is author of one of the four gospels inscribed with his name. See the following article.

St MARK's Gospel, a canonical book of the New Testament, being one of the four gospels.

St Mark wrote his gospel at Rome, where he accompanied St Peter in the year of Christ 44. Tertullian and others pretend, that St Mark was no more than an amanuensis to St Peter, who dictated this gospel to him; others affirm, that he wrote it after St Peter's death. Nor are the learned less divided as to the language it was wrote in; some affirming that it was composed in Greek, others in Latin. Several of the ancient heretics received only the gospel of St Mark: others, among the Catholics, rejected the 12 last verses of this gospel. The gospel of St Mark is properly an abridgement of that of St Matthew.

St MARK the Evangelist's Day, a festival of the Christian church, observed April 25.

Canons of St MARK, a congregation of regular canons founded at Mantua, by Albert Spinola a priest, towards the end of the 12th century. Spinola made a rule for them, which was approved, corrected, and confirmed by several succeeding popes. About the year 1450 they were reformed, and followed only the rule of St Augustine. This congregation having flourished by the space of 400 years, declined by little and little, and is now become extinct.

Knight of St MARK, an order of knighthood in the republic of Venice, under the protection of St Mark the evangelist. The arms of the order are, gules, a lion winged or; with this device, PAX TIBI MARCE EVANGELISTA. This order is never conferred but on those who have done signal service to the commonwealth.

MARK, or *Marc*, in commerce, denotes a weight used in several states of Europe, and for several commodities, especially gold and silver. In France, the mark is divided into eight ounces, 64 drahms, 192 deniers or penny-weights, 160 esterlines, 300 maills, 640 felins, or 4608 grains. In Holland, the mark weight is al-

Mark.

Mark
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Marlbo-
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is called *Troy-weight*, and is equal to that of France. When gold and silver are sold by the mark, it is divided into 25 carats.

MARK is also used among us for a money of account, and in some other countries for a coin. See *MONEY-Table*.

The English mark is two thirds of a pound Sterling, or 13 s. 4 d. and the Scotch mark is of equal value in Scots money of account, viz. 13½ d.

MARKET, a public place in a city or town, in which live-cattle, provisions, or other goods, are set to sale; and also a privilege, either by grant or prescription, by which a town is enabled to keep a market.

Court of the Clerk of the MARKET, is incident to every fair and market in the kingdom, to punish misdemeanors therein; and a court of *pie poudre* is to determine all disputes relating to private or civil property. The object of this jurisdiction (see stat. 17. Car. II. cap. 19. 22 Car. II. cap. 8. 23 Car. II. cap. 12.) is principally the cognizance of weights and measures, to try whether they be according to the true standard thereof or no: which standard was anciently committed to the custody of the bishop, who appointed some clerk under him to inspect the abuse of them more narrowly; and hence this officer, though now usually a layman, is called the clerk of the market.—If they be not according to the standard, then, beside the punishment of the party by fine, the weights and measures themselves ought to be burnt. This is the lowest court of criminal jurisdiction in the kingdom.

MARKHAM (Gervase), an English author, was the son of Robert Markham of Gotham, Esq; in Nottinghamshire, and bore a captain's commission under Charles I. in the civil wars. He was esteemed both a good soldier and a good scholar. He was particularly master of the French, Italian, and Spanish. He wrote, 1. The tragedy of Herod and Antipater, which was printed in 1622. 2. Many volumes upon husbandry and horsemanship. 3. A piece on the art of fowling. 4. The soldiers accidence and grammar.

MARKLAND (Jeremiah,) one of the most learned scholars and penetrating critics of the age, was born in 1692, and received his education in Christ's hospital. He became first publicly known by his *Epistola Critica*, addressed to bishop Hare. In this he gave many proofs of extensive erudition and critical sagacity. He afterwards published an edition of Statius, and some plays of Euripides; and assisted Dr Taylor in his editions of Lyfias and Demosthenes, by the notes which he communicated to him. He has also very happily elucidated some passages in the New Testament, which may be found in Mr Bowyer's edition of it; and was author of a very valuable volume of remarks on the epistles of Cicero to Brutus, and of an excellent little treatise under the title of *Quæstio Grammatica*. He died in 1775, at Milton, near Dorking in Surry; and was a man not more valued for his universal reading than beloved for the excellency of his heart and primitive simplicity of manners.

MARLBOROUGH, a town of Wiltshire in England, situated near the source of the Kennet, at the foot of a chalky hill, 75 miles from London. It has

its name from its chalky soil, which was formerly called *marle*. It was a Roman station. In the year 1627, a parliament was held in the castle here, which made those laws called *Marlborough statutes*. There are still some small remains of its walls and ditch. The town, which is an ancient borough by prescription, sends two members to parliament. It is governed by a mayor, 2 justices, 12 aldermen, 24 burgesses, a town-clerk, 2 bailiffs, 12 serjeants at mace, &c. It consists chiefly of one broad street, with piazzas all along one side of it, two parish churches, and several commodious inns, it being the grand thoroughfare from London to Bath and Bristol. To the south are some remains of a priory, particularly the Gate-house; and the site of a Roman Castrum, the foundations of which have been discovered there, with Roman coins. The ditch is still in some parts 20 feet wide; and towards the river, without the garden walls, one angle of the Castrum is very visible with the rampart and ditch entire. The mount at the west end of the town, which was the keep or main-guard of the castle, is converted into a pretty spiral walk; at the top of which is an octagon summer-house. This town has often suffered by fire, particularly in 1690, whereupon the parliament passed an act to prevent its houses from being thatched. The markets here are Wednesdays and Saturdays; and it has five fairs. Here is a charity-school, which was erected in 1712, for 44 children.

MARLBOROUGH (duke of). See CHURCHILL.

MARLBOROUGH-Fort, an English factory on the west coast of the island of Sumatra in Asia; seated three miles west of the town of Bencoolen. E. Long. 101. 12. S. Lat. 4. 21.

MARLE, a kind of calcareous earth, very much used in agriculture as a manure. See AGRICULTURE, n° 216, 217.

Marle is dug in many places of Great Britain and Ireland. In digging for it in Ireland, they meet with horns and other curious fossils. The marle always lies in the bottoms of low bogs, and is found by boring with *pyres* made for that purpose. It usually lies at five, seven, or nine feet depth. The obtaining it in many places is attended with very considerable expence in draining off the water. The manner of digging it is this: They employ fix able labourers and a supernumerary; and these cut up a hole of 12 feet square, which is supposed a pit that this number of men can manage in one day. Two men dig, two throw it up, and two throw it by, and the supernumerary man supplies defects on all occasions. For the first three feet they dig through a fuzzy earth, fit for making turf or fuel. Under this lies a stratum of gravel, of about half a foot; under this often, for three feet more, there is a more kindly moss, which would make better fuel. This lower stratum is always full of fossile wood, which is usually so soft that the spade cuts as easily through it as through the earth it lies in. Under this, for the thickness of about three inches, is found a series of leaves, principally of the oak. These appear very fair to the eye, but fall to pieces on being touched; and this stratum is sometimes interrupted by vast heaps of seed, which seem to be broom or furze seed. In some places there appear berries of different kinds, and in others several species

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Marle

of sea-plants; all lying in the same confused manner as the oak leaves. Under this vegetable stratum there lies one of blue clay, half a foot thick, and usually full of sea-shells. This blue clay is not so tough as common clay; but is thrown carefully up, and used as marle in some places. Under this always appears the true marle; the stratum of which is usually from two to four feet thick, and sometimes much more.—This marle looks like buried lime, and is full of shells, which are usually of a small size, and of the periwinkle kind; but there are several other sorts at times found among them. Among this marle, and often at the very bottom of it, are found great numbers of very large horns of the deer kind, which are vulgarly called *elk's horns*. These, where they join to the head, are thick and round; and at that joining there grows out a branch, which is about a foot long, and seems to have hung just over the creature's eyes: it grows still round for about a foot above this; and then spreads out broad, and terminates in branches long and round, terminating with a small bend. The labourers are obliged to work in a hurry in all these pits, so that they seldom bring out the horns whole. There are also, at times, found the leg-bones and other parts of the skeletons of the same beasts; but this more rarely, only a few together, and but in few places.

Dr Black is of opinion, that all kinds of marle derive their origin from the calcareous matter of shells and lithophyta.

Shell-marle, says he, is composed of the shells of aquatic animals, which are sometimes very entire, and often decayed or mixed down with other earthy substances. Examining this matter as occurring in different places, it may be distinguished into fresh water marle, and the marle of sea-shells. Of the first we have an example in the Meadow at Edinburgh. Wherever the soil is turned up to the depth of six inches, a quantity appears. It is composed of the shells of a small fresh-water snail or welk. This animal, when alive, is not easily discernible, the shell being much of the same obscure colour as the stones covered with the water. But we can observe a great number of them in all running brooks and other collections of fresh water; and as the animal dies, the shells are deposited where the water stagnates in very great quantity. That composed of sea-shells, constitutes greater collections that are found in innumerable places now far removed from the sea. That most particularly described by Reaumur is a collection of this kind in a province of France, and at Turin. That part of the country where it is found is computed to contain 80 square miles of surface; and wherever they dig to a certain depth, they find this collection of shells: the country at present is 108 miles from the sea. They find the marle eight or nine feet below the surface, and they dig it to the depth of 20 feet. It is still deeper, but they find it too expensive to search for it. He supposes it to be only 18 feet deep; and even at this depth the quantity will appear enormous. It will amount to 140 millions of cubic fathoms of shells that are mostly decayed and broken into fragments, and mixed with other marine productions, as millipores, madripores, and other coralline bodies, which are all productions of the sea.

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MARLINE, in sea affairs, are tarred white flains, or long wreaths or lines of untwisted hemp, dipped in pitch or tar, with which cables or other ropes are wrapped round, to prevent their fretting or rubbing in the blocks or pulleys through which they pass. The same serves in artillery upon ropes used for rigging gins, usually put up in small parcels called *skains*.

MARLOE (Christopher), an English dramatic author, was a student in the university of Cambridge; but afterwards turning player, he trode the same stage with the inimitable Shakespeare. He was accounted an excellent poet even by Ben Johnson himself. He wrote six tragedies, one of which called *Lust's Dominion*, or the *Lecherious Queen*, has been altered by Mrs Behn, and acted under the title of *Abdelazar*, or the *Moor's Revenge*. Some time before his death, he had made a considerable progress in an excellent poem entitled *Hero and Leander*; which was afterwards finished by George Chapman, who is said to have fallen short of the spirit and invention discovered by Marloe. Mr Anthony Wood represents him as a free-thinker, in the worst sense of the word; and gives the following account of his death. Falling deeply in love with a low girl, and having for his rival a fellow in livery, Marloe, imagining that his mistress granted him favours, was fired with jealousy, and rushed upon him in order to stab him with his dagger; but the footman avoided the stroke, and, seizing his wrist, stabbed him with his own weapon; of which wound he died, in the year 1593.

MARLOW, a town of Buckinghamshire, in England, 31 miles from London, lies under the Chiltern Hills, in a marly soil. It is a pretty large borough, though not incorporated, with a bridge over the Thames, not far from its conflux with Wycomb, and has a handsome church and town-hall, with a charity-school for 20 boys, who are taught and clothed. It first sent members to Parliament in the reign of Edward II. Bone lace is its chief manufacture. The Thames brings goods hither from the neighbouring towns, especially great quantities of meal and malt from High-Wycomb, and beech from several parts of the county, which abounds with this wood more than any in England. In the neighbourhood are frequent horse-races; and here are several corn and paper mills, particularly on the river Loddon, between this town and High-Wycomb. There are, besides, the Temple-mills, for making thimbles, and another for pressing oil from rape and flax seeds. Its market is on Saturdays, and fair October 29.

MARLY, a palace belonging to the king of France, between Versailles and St Germain; seated in a valley, near a village and forest of the same name. It is noted for its fine gardens and water-works, there being a curious machine on the river Seine, which not only supplies them with water, but also those of Versailles. It is 10 miles N. W. of Paris. E. Long. 2. 11. N. Lat. 48. 52.

MARMANDE, a town of France, in Guienne, and in Agennois. It carries on a great trade in corn and wine, and is seated on the river Garonne, in E. Long. 0. 15. N. Lat. 38. 35.

MARMALADE, a confection of plums, apricots, quinces, &c. boiled up to a consistence with sugar. In Scot-

Marline

Marmalade

Marmor Scotland, it is made of Seville oranges and sugar only.

Maronites. MARMOR. See MARBLE.

MARMORA, the name of four islands of Asia, in the sea of the same name. The largest is about 30 miles in circumference; and the soil of them all produces corn, wine, and fruits. The sea of Marmora is a large gulph, which communicates both with the Archipelago and the Black Sea by that of Constantinople, being 120 miles in length and 50 in breadth; and all ships must pass through it that sail to Constantinople from the Mediterranean. It was anciently the *Propontis*.

MARMORICA, a country of Africa anciently inhabited by the Libyans. It was bounded on the east by Egypt, on the west by Cyrenaica, on the south by Sahara, or the desert of Libya Interior, and on the north by the Mediterranean; and was reckoned a part of Egypt. There is no distinct history of the country.

MAROBUDUM (anc. geog.), the royal residence of Marobudus, king of the Marcomanni; and hence the appellation. Now thought to be *Prague*, the capital of Bohemia.

MAROLLES (Michel de), born in 1600, was the son of Claude de Marolles, whom French memoirs make a military hero. Michel, however, was of a different composition. He entered early into the ecclesiastical state, and by the interest of his father obtained two abbeys. He was formed with an extreme ardour for study, which never abated all his life long: for, from 1619 when he published a translation of Lucan, to 1681 the year of his death, he was constantly employed in writing and printing. He attached himself unfortunately to the translating of ancient Latin writers: but, being devoid of all classical taste and spirit, they sunk miserably under his hands, the poets especially. He was certainly, however, a man of great learning, and discovered all his life a love for the arts. He was one of the first who paid any attention to prints; and collected about 100,000, which make at this day one of the ornaments of the French king's cabinet. He composed memoirs of his own life, which were published by the Abbé Goujet, 1755, in 3 vols. They contain, like such sort of things, some interesting facts, but an infinity of minute and insipid nothings.

MARONITES, in ecclesiastical history, a sect of eastern Christians, who follow the Syrian rite, and are subject to the pope; their principal habitation being on mount Libanus.

Mosheim informs us, that the doctrine of the Monothelites, condemned and exploded by the council of Constantinople, found a place of refuge among the Mardaites, a people who inhabited the mounts Libanus and Antilibanus, and who, about the conclusion of the seventh century, were called *Maronites*, after *Maro* their first bishop; a name which they still retain. None (he says) of the ancient writers give any certain account of the first person who instructed these mountaineers in the doctrine of the Monothelites: it is probable, however, from several circumstances, that it was John Maro, whose name they had adopted; and that this ecclesiastic received the name of Maro from his having lived in the character of a monk in the fa-

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mous convent of St Maro, upon the borders of the Maronites, Orontes, before his settlement among the Mardaites of mount Libanus. One thing is certain, from the testimony of Tyrius and other unexceptionable witnesses, as also from the most authentic records, viz. that the Maronites retained the opinions of the Monothelites until the 12th century, when, abandoning and renouncing the doctrine of one will in Christ, they were readmitted in the year 1182 to the communion of the Roman church. The most learned of the modern Maronites have left no method unemployed to defend their church against this accusation; they have laboured to prove, by a variety of testimonies, that their ancestors always persevered in the Catholic faith, in their attachment to the Roman pontiff, without ever adopting the doctrine of the Monophysites, or Monothelites. But all their efforts are insufficient to prove the truth of these assertions to such as have any acquaintance with the history of the church and the records of ancient times; for to all such the testimonies they allege will appear absolutely fictitious and destitute of authority.

Faustus Nairon, a Maronite settled at Rome, has published an apology for Maron and the rest of his nation. His tenet is, that they really took their name from the Maron, who lived about the year 400, and of whom mention is made in Chrysostom, Theodoret, and the Menologium of the Greeks. He adds, that the disciples of this Maron spread themselves throughout all Syria; that they built several monasteries, and, among others, one that bore the name of their leader; that all the Syrians who were not tainted with heresy took refuge among them; and that for this reason the heretics of those times called them Maronites.

Mosheim observes, that the subjection of the Maronites to the spiritual jurisdiction of the Roman pontiff was agreed to with this express condition, that neither the popes nor their emissaries should pretend to change or abolish any thing that related to the ancient rites, moral precepts, or religious opinions, of this people: so that in reality there is nothing to be found among the Maronites that favours of popery, if we except their attachment to the Roman pontiff, who is obliged to pay very dear for their friendship. For, as the Maronites live in the utmost distress of poverty, under the tyrannical yoke of the Mahometans, the bishop of Rome is under the necessity of furnishing them with such subsidies as may appease their oppressors, procure a subsistence for their bishop and clergy, provide all things requisite for the support of their churches, and the uninterrupted exercise of public worship, and contribute in general to lessen their misery. It is certain that there are Maronites in Syria who still behold the church of Rome with the greatest aversion and abhorrence; nay, what is still more remarkable, great numbers of that nation residing in Italy, even under the eye of the pontiff, opposed his authority during the last century, and threw the court of Rome into great perplexity. One body of these non-conforming Maronites retired into the valleys of Piedmont, where they joined the Waldenses; another, above 600 in number, with a bishop and several ecclesiastics at their head, fled into Corsica, and implored the protection of the republic of Genoa against the violence of the inquisitors.

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The Maronites have a patriarch, who resides in the monastery of Cannubin, on mount Libanus, and assumes the title of patriarch of Antioch, and the name of Peter, as if he seemed desirous of being considered as the successor of that apostle. He is elected by the clergy and the people, according to the ancient custom; but, since their reunion with the church of Rome, he is obliged to have a bull of confirmation from the pope. He keeps a perpetual celibacy, as well as the rest of the bishops his suffragans: as to the rest of the ecclesiastics, they are allowed to marry before ordination; and yet the monastic life is in great esteem among them. Their monks are of the order of St Antony, and live in the most obscure places in the mountains, far from the commerce of the world.

As to their faith, they agree in the main with the rest of the eastern church. Their priests do not say mass singly; but all say it together, standing round the altar. They communicate in unleavened bread; and the laity have hitherto partaken in both kinds, though the practice of communicating in one has of late been getting footing, having been introduced by little and little. In Lent they eat nothing, unless it be two or three hours before sun-rising: their other fastings are very numerous.

To MAROON, to put one or more sailors ashore upon a desolate island, under pretence of their having committed some great crime. This detestable expedient has been repeatedly practised by some inhuman commanders of merchant-ships, particularly in the West Indies.

MAROT (Clement), the best French poet of his time, was born at Cahors in 1495; and was the son of John Marot, valet de chambre to Francis I. and poet to queen Anne of Brittany. He enjoyed his father's place of valet de chambre to Francis I. and was page to Margaret of France wife to the duke of Alençon. In 1521 he followed that prince into Italy, and was wounded and taken prisoner at the battle of Pavia; but at his return to Paris was accused of heresy, and thrown into prison, from whence he was delivered by the protection of king Francis I. He at length retired to the queen of Navarre, then to the duchess of Ferrara, and in 1536 returned to Paris: but declaring openly for the Calvinists, he was obliged to fly to Geneva; which he at length left, and retiring to Piedmont, died at Turin in 1544, aged 50. His verses are agreeably filled with natural beauties. La Fontaine acknowledged himself his disciple, and contributed greatly to restore to vogue the works of this ancient poet. Marot, besides his other works, has translated part of the Psalms into verse, which was continued by Beza, and are still sung in the Protestant churches abroad.—*Michael Marot*, his son, was also the author of some verses; but they are not comparable to those of *John*, and much less to those of *Clement Marot*.—The works of the three *Marots* were collected and printed together at the Hague in 1731, in 3 vols 4to, and in 6 vols 12mo.

MARPURG, a strong and considerable town of Germany, in the Upper Rhine, and in the landgrate of Hesse-Cassel, with an university, a castle, a palace, a handsome square, and a magnificent town-house. It is seated on the river Lahn, in a pleasant

country, 15 miles south of Waldeck, and 47 south-west of Cassel. E. Long. 8. 53. N. Lat. 50. 42.

MARPURG, a handsome town of Germany, in Lower Styria, seated on the river Drave, 25 miles south-west of Gratz, and 60 north-east of Laubach. E. Long. 16. 10. N. Lat. 46. 42.

MARQUARD (Freber), an eminent German civilian, born at Augsburg in 1565. He studied at Bourges, under the learned Cujas; and acquired great skill in polite literature, and in the laws. At his return to Germany, he became counsellor to the elector Palatine, and professor of law at Heidelberg; and was afterwards sent by the elector Frederic IV. as his minister, into Poland, to Mentz, and several other courts. He died at Heidelberg in 1614. He wrote many works which are esteemed; the principal of which are, 1. *De re monetaria veterum Romanorum, et hodierni apud Germanos imperii.* 2. *Rerum Bohemicarum scriptores.* 3. *Rerum Germanicarum scriptores.* 4. *Corpus historie Francie, &c.*

MARQUE, or *Letters of MARQUE*, in military affairs, are letters of reprisal, granting the subjects of one prince or state liberty to make reprisals on those of another.—They are so called from the German *marcke*, “limit, frontier;” as being *jus concessum in alterius principis marckas seu limites transeundi, sibi que jus faciendi*; as being a right of passing the limits or frontiers of another prince, and doing one's self justice.

Letters of marque among us are extraordinary commissions granted by authority for reparation to merchants taken and despoiled by strangers at sea; and reprisals is only the retaking, or taking of one thing for another*. The form in these cases is, the sufferer must first apply to the lord privy-seal, and he shall make out letters of request under the privy-seal; and if, after such request of satisfaction made, the party required do not, within convenient time, make due satisfaction or restitution to the party grieved, the lord chancellor shall make him out letters of marque under the great seal; and by virtue of these he may attack and seize the property of the aggressor nation, without hazard of being condemned as a robber or pirate. * See Pre-rogative.

MARQUESAS ISLANDS, the name of certain islands in the South Sea, lying between 8 and 10 degrees of south latitude, and between 139 and 140 degrees of west longitude. They are five in number, viz. La Magdalena, St Pedro, La Dominica, Santa Christina, and Hood Island. All the natives of these islands may be supposed to be of the same tribe. Those spots that are fit for culture are very populous; but as every island is very mountainous, and has many inaccessible and barren rocks, it is to be doubted whether the whole population of this group amounts to 50,000 persons. The Spaniards, who first visited here, found the manners of this people gentle and inoffensive; but these qualities did not prevent those who landed from wantonly butchering several of the natives at Magdalena.

The inhabitants of these islands collectively, says Captain Cook, are, without exception, the finest race of people in the South Sea. For symmetry of shape, and regular features, they perhaps surpass all other nations. Not a single deformed or ill-proportioned person was seen on the island; all were strong, tall, well-limbed, and remarkably active. The men are about five

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Marquesas.

Marquesas. five feet ten or six inches high; their teeth are not so good, nor are their eyes so full and lively, as those of many other nations: their hair is of many colours, but none red; some have it long, but the most general custom is to wear it short, except a bunch on each side the crown, which they tie in a knot: their countenances are pleasing, open, and full of vivacity: they are of a tawny complexion, which is rendered almost black by punctures over the whole body. They were entirely naked, except a small piece of cloth round their waist and loins. The punctures were disposed with the utmost regularity, so that the marks on each leg, arm, and cheek, were exactly similar. The women, in two days time, began to appear in considerable numbers, and the sailors found them not less kind than those of the other islands which they had visited: they were inferior to the men in stature, but well proportioned; their general colour was brown; no punctures were observed upon them; they wore a single piece of cloth made of the mulberry bark, which covered them from the shoulders to the knees.

The principal head-dress used in the islands, and what appear to be their chief ornament, is a sort of broad fillet, curiously made of the fibres of the husks of cocoa-nuts; in the front is fixed a mother-of-pearl shell, wrought round to the size of a tea-saucer; before that another smaller, of very fine tortoise-shell, perforated into curious figures; also before, and in the centre of that, is another round piece of mother-of-pearl, about the size of half a crown; and before this another piece of perforated tortoise-shell, the size of a shilling. Besides this decoration in front, some have it also on each side, but in small pieces; and all have fixed to them the tail-feathers of cocks, or tropic-birds, which when the fillet is tied on stand upright, so that the whole together makes a very sprightly ornament. They wear round the neck a kind of ruff or necklace made of light wood, the outward and upper sides covered with small pease, which are fixed on with gum; they also wear some bunches of human hair fastened to a string, and tied round the legs and arms. But all the above ornaments are seldom seen on the same person. All these ornaments, except the last, they freely parted with for a trifling consideration; but the human hair they valued very highly, though these bunches were the usual residence of many vermin. It is probable, that these were worn in remembrance of their deceased relations, and therefore were looked upon with some veneration; or they may be the spoils of their enemies, worn as the honourable testimonies of victory. However, a large nail, or something which struck their eyes, commonly got the better of their scruples. The king, or chief of the island, came to visit Captain Cook; he was the only one seen completely dressed in this manner. Their ordinary ornaments are necklaces, and amulets made of shells, &c. All of them had their ears pierced, though none were seen with ear-rings. The king had not much respect paid him by his attendants: he presented Captain Cook with some fruit and hogs; and acquainted him that his name was *Honoo*, and that he was *be-ka-ai*, which title seems to correspond with the *aree* of Otaheitee, and *arekee* of the Friendly Isles. Their dwellings are in the valleys, and on the sides of the hills near their plantations. They are built in the same manner as those

at Otaheitee, which will be particularly described *Marquesas.* when we speak of that island; but they are much meaner, and are only covered with the leaves of the bread-fruit tree: in general, they are built on a square or oblong pavement of stone, raised some height above the level of the ground; they likewise have such pavement near their houses, on which they sit to eat and amuse themselves. Along the uppermost edge of the mountain a row of stakes or palisadoes, closely connected together, were seen like a fortification, in which, by the help of glasses, appeared something like huts, which seemed to bear a great resemblance to the hupas of New-Zealand, which will be described in speaking of that country. Their canoes resemble those of Otaheitee, but not so large; their heads had commonly some flat upright piece, on which the human face was coarsely carved; and their sails were made of mats, triangular in shape, and very broad at the top: the paddles which they used were of heavy hard wood; short, but sharp-pointed, and with a knob at the upper end; they were from 10 to 20 feet long, and about 15 inches broad.

Their weapons were all made of the club-wood, or casuarina; and were either plain spears about 8 or 10 feet long, or clubs which commonly had a knob at one end. They have also slings with which they throw stones with great velocity, and to a great distance, but not with a good aim.

The language of these people is much nearer to that of Otaheitee than any other dialect in the South-Sea, except that they could not pronounce the letter *r*.

The only quadrupeds seen here were hogs, except rats; here were fowls, and several small birds in the woods, whose notes were very melodious. The chief difference between the inhabitants of the Marquesas and those of the Society Islands seems to consist in their different degrees of cleanliness: the former do not bathe two or three times a-day, nor wash their hands and face before and after every meal, as the latter do; and they are besides very slovenly in the manner of preparing their meals. Their diet is chiefly vegetable; though they have hogs and fowls, and catch abundance of fish at certain times. Their drink is pure water, cocoa-nuts being scarce here.

It was not long before the propensity of the natives was discovered to be rather to receive than give; for when they had taken a nail as the price of a bread-fruit, the article so purchased could not be obtained from them. To remove this dishonest disposition, captain Cook ordered a musket to be fired over their heads, which terrified them into fair-dealing.

Soon after the natives had gathered courage enough to venture on board the ship, one of them unfortunately stole an iron stanchion from the gang-way, with which he sprang into the sea, and, notwithstanding its weight, swam with it to his canoe, and was making to the shore with all speed. A musket was fired over his head to frighten him back, but to no effect, he still continued to make off with his booty; the whistling of another ball over his head was as ineffectual: an officer, less patient of such an injury than reason and humanity should have taught him to be, levelled a musket at the poor fellow, and shot him thro' the head. Captain Cook had given orders to fire over

Marquesas, the canoe, but not to kill any one; he was in a boat, and came up with the canoe soon after. There were two men in her: one sat bailing out the blood and water in a kind of hysseric laugh; the other, a youth of about 14 or 15 years of age, who afterwards proved to be the son of the deceased, fixed his eyes on the dead body with a serious and dejected countenance. This act of severity, however, did not estrange the islanders to the ship, and a traffic was carried on to the satisfaction of both parties; bread-fruit, bananas, plantains, and some hogs, were given in exchange for small nails, knives, and pieces of Amsterdam cloth; red feathers of the Amsterdam-Island were greatly esteemed here. Captain Cook, accompanied with the gentlemen of the ship, in their walks about the country, lighted on the house which had been the habitation of the man who had been shot; there they found his son, who fled at their approach: they enquired for his female relations, and were told that they remained at the top of the mountain, to weep and mourn for the dead. Notwithstanding they were then among the relations of a man who had been killed by them, not the least tokens of animosity or revenge were discernible among the natives.

The weather being extremely hot, the inhabitants made use of large fans to cool themselves, of which great numbers were purchased; these fans were formed of a kind of tough bark, or grass, very firmly and curiously plaited, and frequently whitened with shell-lime. Some had large feathered leaves of a kind of palm, which answered the purpose of an umbrella.

The natives at length became so familiar as to mount the sides of the ship in great numbers. They frequently danced upon deck for the diversion of the sailors: their dances very much resembled those of Otaheitee; their music too was very much the same.

A sailor having been inattentive to his duty, received several blows from Captain Cook; on seeing which, the natives exclaimed, *tape-a hei-te ina*, "he beats his brother." From other instances that had occurred, it was clear that they knew the difference between the commander and his people, but at the same time they conceived them all brethren; and, says Mr Forster, "to me the most natural inference is, that they only applied an idea to us in this case, which really existed with regard to themselves; they probably look on themselves as one family, of which the eldest born is the chief or king."

MARQUETRY, IN-LAID WORK; a curious kind of work, composed of pieces of hard fine wood of different colours, fastened, in thin slices, on a ground, and sometimes enriched with other matters, as tortoise-shell, ivory, tin, and brads.

There is another kind of marquetry made, instead of wood, of glasses of various colours; and a third, where nothing but precious stones and the richest marbles are used: but these are more properly called *mosaic-work*. See **MOSAIC**.

The art of inlaying is very ancient; and is supposed to have passed from the east to the west, as one of the spoils brought by the Romans from Asia. Indeed it was then but a simple thing; nor did it arrive at any

tolerable perfection till the 15th century among the Italians: it seems, however, to have arrived at its height in the 17th century among the French.

Till John of Verona, a cotemporary with Raphael, the finest works of this kind were only black and white, which are what we now call *Morefco's*; but that religious, who had a genius for painting, stained his woods with dyes or boiled oils, which penetrated them. But he went no farther than the representing buildings and perspectives, which require no great variety of colours. Those who succeeded him, not only improved on the invention of dyeing the woods, by a secret which they found of burning them without consuming, which served exceedingly well for the shadows; but had also the advantage of a number of fine new woods of naturally bright colours, by the discovery of America. With these assistances the art is now capable of imitating any thing; whence some call it the *art of painting in wood*.

The ground whereon the pieces are to be ranged and glued, is ordinarily of oak or fir well dried; and to prevent warping, is composed of several pieces glued together. The wood to be used, being reduced into leaves, of the thickness of a line, is either stained with some colour, or made black for shadow; which some effect by putting it in sand extremely heated over the fire, others by steeping it in lime-water and sublimate, and others in oil of sulphur.—Thus coloured, the contours of the piece are formed according to the parts of the design they are to represent.

The last is the most difficult part of marquetry, and that wherein most patience and attention are required. The two chief instruments used herein are the saw and the vice; the one, to hold the matters to be formed; the other, to take off from the extremes, according to occasion. The vice is of wood, having one of its chaps fixed; the other moveable, and is opened and shut by the foot, by means of a cord fastened to a treadle. Its structure is very ingenious, yet simple enough.

The leaves to be formed (for there are frequently three or four of the same kind formed together) are put within the chaps of the vice, after being glued on the outermost part of the design whose profile they are to follow; then the workman pressing the treadle, and thus holding fast the piece, with his saw runs over all the outlines of the design.—By thus joining and forming three or four pieces together, they not only gain time, but the matter is likewise the better enabled to sustain the efforts of the saw; which, how delicate soever it may be, and how lightly soever the workman may conduct it, without such a precaution would be apt to raise splinters, to the ruin of the beauty of the work.

When the work is to consist of one single kind of wood, or of tortoise-shell, on a copper or tin ground, or *vice versa*, they only form two leaves on one another, *i. e.* a leaf of metal, and a leaf of wood or shell: this they call *sawing in counter-parts*; for by filling the vacuities of one of the leaves by the pieces coming out of the other, the metal may serve as a ground to the wood, and the wood to the metal.

All the pieces thus formed with the saw, and marked to know them again, and the shadow given in the man-

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Marriage.

ner already mentioned; they vaneer or fasten each in its place on the common ground; using for that purpose the best English glue.

The whole is put in a press to dry, planed over, and polished with the skin of the sea-dog, wax, and shave-grass, as in simple vaneering; with this difference, however, that in marquetry the fine branches, and several of the more delicate parts of the figures, are touched up and finished with a graver.

It is the cabinet-makers, joiners, and toy-men among us who work in marquetry; it is the enamelers and stone-cutters who deal in mosaic-work: the instruments used in the former are mostly the same with those used by the ebonists.

MARQUIS, a title of honour, next in dignity to that of duke. His office is to guard the frontiers and limits of the kingdom, which were called the *marches*, from the Teutonic word *marche*, a "limit:" as, in particular, were the marches of Wales and Scotland, while they continued hostile to England. The persons who had command there, were called *lords marchers*, or *marqueffes*; whose authority was abolished by statute 27 Hen. VIII. c. 27. though the title had long before been made a mere design of honour, Robert Vere earl of Oxford being created marquis of Dublin by Richard II. in the eighth year of his reign. A marquis is created by patent; his mantle is double ermine, three doublings and a half; his title is *most honourable*; and his coronet has pearls and strawberry-leaves intermixed round, of equal height.

MARR, that part of Aberdeenshire situated between the rivers Dee and Don.

MARRACCI (Lewis), a very learned Italian, was born at Lucca in Tuscany in 1612. After having finished his juvenile studies, he entered into the congregation of regular clerks of the mother of God, and distinguished himself early by his learning and merit. He taught rhetoric seven years, and passed thro' several offices of his order. He applied himself principally to the study of languages, and attained of himself the knowledge of the Greek, the Hebrew, the Syriac, the Chaldee, the Arabic; which last he taught some time at Rome, by the order of pope Alexander VII. Pope Innocent XI. chose him for his confessor, and placed great confidence in him. He would have advanced him to ecclesiastical dignities, if Marracci had not opposed him.—Marracci died at Rome in 1700, aged 87.—He was the author of several pieces in Italian; but the grand work, which has made him deservedly famous all over Europe, is his edition of the Alkoran, in the original Arabic, with a Latin version, notes, and confutation of his own. It was beautifully printed in 2 vols folio at Padua in 1698. The Latin version of the Alkoran, by Marracci, with notes and observations from him and others, and a synopsis of the Mahometan religion, by way of introduction, was published by Heineccius at Leipzig, 1721, in 8vo. Marracci had also a hand in the "*Biblia sacra Arabica, sacrae congregationis de propaganda fide jussu edita, ad usum ecclesiarum orientalium*," Rome 1671, in 3 vols folio.

MARRIAGE, a contract, both civil and religious, between a man and a woman, by which they engage to live together in mutual love and friendship for the ends of procreation, &c. See *MORAL Philosophy*.

Marriage is part of the law of nations, and is in use among all people. The Romanists account it a sacrament.—The woman, with all her moveable goods, immediately upon marriage, passes wholly *in potestatem viri*, "into the power and disposal of the husband."

The first inhabitants of Greece lived together without marriage. Cecrops, king of Athens, is said to have been the first author of this honourable institution among that people. After the commonwealths of Greece were settled, marriage was very much encouraged by their laws, and the abstaining from it was discountenanced and in many places punished. The Lacedemonians were very remarkable for their severity towards those who deferred marriage beyond a limited time, as well as to those who wholly abstained from it. The Athenians had an express law, that all commanders, orators, and persons intrusted with any public affair, should be married men. Polygamy was not commonly tolerated in Greece. The time of marriage was not the same in all places. The Spartans were not permitted to marry till they arrived at their full strength; the reason assigned for which custom by Lycurgus was, that the Spartan children might be strong and vigorous: and the Athenian laws are said to have once ordered, that men should not marry till 35 years of age. The season of the year which they preferred for this purpose was the winter, and particularly the month of January, called *Gamelion*. The Greeks thought it scandalous to contract marriage within certain degrees of consanguinity; whilst most of the barbarous nations allowed incestuous mixtures.

Most of the Grecian states, especially such as made any figure, required their citizens should match with none but citizens, and the children were not allowed to marry without the consent of their parents. The usual ceremonies in promising fidelity was kissing each other, or giving their right hands, which was a general form of ratifying all agreements. Before the marriage could be solemnized, the gods were to be consulted, and their assistance implored by prayers and sacrifices, which were offered to some of the deities that superintended these affairs, by the parents or nearest relations of the persons to be married. When the victim was opened, the gall was taken out and thrown behind the altar, as being the seat of anger and malice, and therefore the aversion of all the deities who had the care of love, as well as those who became their votaries. For the particularities relating to the bride and bridegroom, see BRIDE and BRIDE-GROOM.

The Romans, as well as the Greeks, disallowed of polygamy. A Roman might not marry any woman who was not a Roman. Among the Romans, the kalends, nones, and ides of every month were deemed unlucky for the celebration of marriage, as was also the feast of the *parentalia*, and the whole month of May. The most happy season in every respect was that which followed the ides of June.

The Roman laws speak of second marriages in very hard and odious terms: *Matre jam secundis nuptiis funestata*, L. iii. C. de sec. nuptiis. By these laws it was enacted, that the effects of the husband or wife deceased should pass over to the children, if the survivor should marry a second time. By the law *Hac*
edictali

Marriage. *edictali* (Cod. de sec. nupt.), the survivor, upon marrying a second time, could not give the person he married a portion more than equal to that of each of the children. In the primitive church the respect to chastity was carried so high, that a second marriage was accounted no other than a lawful whoredom, or a species of bigamy; and there are some ancient canons which forbid the ecclesiastics from being present at second marriages.

Marriage, by the Mosaic law, was subject to several restrictions: thus by Levit. chap. xviii. ver. 16. a man was forbid to marry his brother's widow unless he died without issue; in which case it became enjoined as a duty. So it was forbid to marry his wife's sister, while she was living, ver. 18.; which was not forbidden before the law, as appears from the instance of Jacob.

The ancient Roman law is silent on this head; and Papinian is the first who mentions it, on occasion of the marriage of Caracalla. The lawyers who came after him stretched the bonds of affinity so far, that they placed adoption on the same foot with nature.

Affinity, according to the modern canonists, renders marriage unlawful to the fourth generation, inclusive; but this is to be understood of direct affinity, and not of that which is secondary or collateral. *Affinis mei affinis, non est affinis meus.* It is farther to be observed, that this impediment of marriage does not only follow an affinity contracted by lawful matrimony, but also that contracted by a criminal commerce; with this difference, that this last does extend beyond the second generation; whereas the other, as has been observed, reaches to the fourth.

In Germany they have a kind of marriage called *morganatic*, wherein a man of quality contracting with a woman of inferior rank, he gives her the left hand in lieu of the right; and stipulates in the contract that the wife shall continue in her former rank or condition; and that the children born of them shall be of the same, so that they become bastards as to matters of inheritance, though they are legitimate in effect. They cannot bear the name or arms of the family. None but princes and great lords of Germany are allowed this kind of marriage. The universities of Leipzig and Jena have declared against the validity of such contracts; maintaining that they cannot prejudice the children, especially when the emperor's consent intervenes in the marriage.

The Turks have three kinds of marriages, and three sorts of wives; *legitimate*, *wives in kebin*, and *slaves*. They marry the first, hire the second, and buy the third.

Among all the savage nations, whether in Asia, Africa, or America, the wife is commonly bought by the husband from her father or those other relations who have an authority over her; and the conclusion of a bargain for this purpose, together with the payment of the price, has therefore become the usual form or solemnity in the celebration of their marriages. The Hebrews also purchased their wives by paying down a competent dowry for them; and Aristotle makes it one argument to prove that the ancient Grecians were an uncivilized people, because they used to buy their wives; and in proportion as they laid aside their barbarous manners they left off this practice.

The English law considers marriage in no other

light than as a civil contract; the holiness of the matrimonial state being left entirely to the ecclesiastical law, to which it pertains, to punish or annul incestuous or other unscriptural marriages. The law allows marriage to be good and valid, where the parties at the time of making it were willing and able to contract, and actually did contract, in the proper forms and solemnities required by law. The disabilities for contracting are of two sorts: first such as are canonical, and therefore sufficient by the ecclesiastical laws to void the marriage in the spiritual court; such as pre-contract, consanguinity, or relation by blood; and affinity, or relation by marriage, and some particular corporal infirmities. But these disabilities in our law do not make the marriage *ipso facto* void, but voidable only by sentence of separation; and marriages are esteemed valid to all civil purposes, unless such separation is actually made during the life of the parties. Thus when a man had married his first wife's sister, and after her death the bishop's court was proceeding to annul the marriage and bastardise the issue, the court of king's bench granted a prohibition *quoad hoc*; but permitted them to proceed to punish the husband for incest.

By 32 Hen. VIII. c. 38. it is declared, that all persons may lawfully marry but such as are prohibited by God's law, &c. And that nothing (God's law excepted) shall impeach any marriage but within the Levitical degrees: these are enumerated in the 18th chapter of Leviticus, and are illustrated by Lord Coke in this manner: a man may not marry his mother, father's sister, mother's sister, sister, daughter, daughter of his son or daughter, father's wife, uncle's wife, father's wife's daughter, brother's wife, wife's sister, son's wife or wife's daughter, and daughter of his wife's son or daughter. And a woman may not marry her father, father's brother, mother's brother, brother, son, son of her husband's son or daughter, mother's husband, aunt's husband, sister's husband, husband's brother, and son of her husband's son or daughter. By the civil law first cousins are allowed to marry; but by the canon law both first and second cousins are prohibited. Therefore when it is vulgarly said that first cousins may marry but second cousins cannot, this probably arose by confounding these two laws; for first cousins may marry by the civil law, and second cousins cannot by the canon law. But by the fore-said stat. 32 Hen. VIII. c. 38. it is clear, that both first and second cousins may marry. By the same statute all impediments arising from pre-contracts to other persons were abolished, and declared of none effect unless they had been consummated with bodily knowledge; in which case the canon law holds such contract to be a marriage *de facto*. But this branch of the statute was repealed by 2 & 3 Ed. VI. c. 23. How far the act of 26 Geo II. c. 33. (which prohibits all suits in ecclesiastical courts to compel a marriage in consequence of any contract) may collaterally extend to revive this clause of Henry VIII.'s statute, and abolish the impediment of pre-contract, judge Blackstone leaves to be considered by the canonists. We shall here observe, that on a promise of marriage, if it be mutual on both sides, damages may be recovered in case either party refuses to marry; and tho' no time for the marriage is agreed on, if the plaintiff avers

Marriage. avers that he offered to marry the defendant who refused it, an action is maintainable for the damages; but no action shall be brought upon any agreement except it is in writing, and signed by the party to be charged. The canonical hours for celebrating marriage are from 8 to 12 in the forenoon.

The other sort of disabilities are those which are created, or at least enforced, by the municipal laws. These civil disabilities make the contract void *ab initio*, by rendering the parties incapable of forming any contract at all. The first legal disability is a prior marriage, or having another husband or wife living; in which case, besides the penalties consequent upon it as a felony, the second marriage is to all intents and purposes void. See BIGAMY and POLYGAMY.

The next legal disability is want of age: therefore if a boy under 14, or a girl under 12 years of age, marries, when either of them comes to the age of consent, they may disagree and declare the marriage void, without any divorce or sentence in the spiritual court. However, in our law it is so far a marriage, that if at the age of consent they agree to continue together, they need not be married again. Another incapacity arises from want of consent of parents or guardians. By several statutes, viz. 6 & 7 W. III. c. 6. 7. 8. W. III. c. 35. 10 Ann. c. 19. penalties of 100 l. are laid on every clergyman who marries a couple either without publication of banns, which may give notice to parents or guardians, or without a licence, to obtain which the consent of parents or guardians must be sworn to. And by 4 & 5 Ph. & M. c. 8. whosoever marries any woman child under the age of 16 years, without consent of parents or guardians, shall be subject to fine or five years imprisonment; and her estate during her husband's life shall be enjoyed by the next heir. Thus also in France the sons cannot marry without consent of parents till 30 years of age, nor the daughters till 25; and in Holland the sons are at their own disposal at 25, and the daughters at 20. And by the marriage act, viz. 26 Geo. II. c. 33. it is enacted, that all marriages celebrated by licence (for banns suppose notice), where either of the parties is under 21, not being a widow or widower, without the consent of the father, or if he be not living of the mother or guardians, shall be absolutely void. However, provision is made where the mother or guardian is non compos, beyond sea, or unreasonably froward, to dispense with such consent at the discretion of the lord chancellor; but no provision is made in case the father should labour under any mental or other incapacity. A fourth incapacity is want of reason. It is provided by 15 Geo. II. c. 30. that the marriage of lunatics and sons under phrensies (if found lunatics under a commission or committed to the care of trustees by any act of parliament) before they are declared of sound mind by the lord chancellor, or the majority of such trustees, shall be totally void. Lastly, the parties must not only be willing and able to contract, but must actually contract themselves in due form of law, to make it a good civil marriage. Any contract made *per verba de presenti*, or in words of the present tense, and in case of cohabitation *per verba de futuro* also between persons able to contract, was before the late act deemed a valid marriage to many purposes, and

the parties might be compelled in the spiritual courts to celebrate it *in facie ecclesie*. But these verbal contracts are now of no force to compel a future marriage. Nor is any marriage at present valid that is not celebrated in some parish church, or public chapel, unless by dispensation from the archbishop of Canterbury. It must also be preceded by publication of banns or by licence from the spiritual judge. A marriage in pursuance of banns must be solemnized in one of the churches or chapels where the banns were published. No parson, vicar, &c. shall be obliged to publish banns of matrimony, unless the persons to be married shall, seven days before the time required for the first publication, deliver to him a notice in writing of their true names, and of the house or houses of their respective abode within such parish, &c. and of the time that they have dwelt in such house or houses. And the said banns shall be published upon three Sundays preceding the solemnization of marriage during the time of public service: in case the parents or guardians, or either of the parties who shall be under the age of 21 years, shall openly and publicly declare, or cause to be declared in the church or chapel where the banns shall be so published, at the time of such publication, their dissent to such marriage, such publication of banns shall be void. And when the parties dwell in divers parishes, the curate of the one parish shall not solemnize matrimony betwixt them without a certificate of the banns being thrice asked from the curate of the other parish. A marriage in pursuance of a licence (except a special licence) must be solemnized in such church or chapel where the licence is granted; and no licence of marriage shall be granted by any archbishop, bishop, &c. to solemnize any marriage in any other church, &c. than in the parish church, &c. within which the usual place of abode of one of the parties shall have been for four weeks immediately before the granting such licence. By the same statute all marriages shall be solemnized in the presence of two credible witnesses at the least, besides the minister, who shall sign their attestation thereof; and immediately after the celebration of every marriage, an entry thereof shall be made in the parish-register, expressing that the said marriage was celebrated by banns or licence; and if both or either of the parties be under age, with consent of the parents or guardians, as the case shall be, signed by the minister, and also by the parties married, and attested by the two witnesses present. It is held to be also essential to a marriage, that it be performed by a person in orders; though the intervention of a priest to solemnize this contract is merely *juris positivi*, and not *juris naturalis aut divini*; it being said that Pope Innocent III. was the first who ordained the celebration of marriage in the church, before which it was totally a civil contract. And in the times of the grand rebellion, all marriages were performed by the justices of the peace; and these marriages were declared valid without any fresh solemnization, by 12 Car. II. c. 33. But as the law now stands, we may upon the whole collect, that no marriage by the temporal law is *ipso facto* void, that is celebrated by a person in orders; in a parish-church, a public chapel, or elsewhere, by a special dispensation; in pursuing of banns or a licence; between single persons; consenting; of sound mind; and of the age of 21 years; or

Marriage. of the age of 14 in males and 12 in females, with consent of parents or guardians, or without it, in case of widowhood. And no marriage is voidable by the ecclesiastical law after the death of either of the parties; nor during their lives, unless for the canonical impediments of precontract, if that indeed still exists; of consanguinity; and of affinity or corporal imbecility subsisting previous to the marriage.

By 26 Geo. II. c. 33. the substance of which has been already recited, if any person shall solemnize matrimony in any other place than a church, &c. where banns have been usually published, unless by special licence, or without publication of banns, unless licence of marriage be first obtained from some person having authority to grant the same, every such person knowingly so offending shall be guilty of felony, and transported for 14 years; the prosecution to be within three years. By the same statute, to make a false entry into a marriage-register; to alter it when made; to forge or counterfeit such entry, or a marriage li-

cence, or aid and abet such forgery; to utter the same as true, knowing it to be counterfeit; or to destroy or procure the destruction of any register in order to vacate any marriage, or subject any person to the penalties of this act; all these offences, knowingly and wilfully committed, subject the party to the guilt of felony without benefit of clergy. But this act doth not extend to the marriages of the royal family; nor to Scotland; nor to any marriages among the people called *quakers*, or among persons professing the Jewish religion, where both the parties are quakers or Jews respectively; nor to any marriages beyond the seas.

In Scotland, the parties living together as man and wife, or declaring themselves so before witnesses, makes a valid though informal marriage. See LAW, Part III. n° 160.

For the proportions which marriages bear to births, and births to burials, in several parts of Europe, Mr Derham gives us the following table.

Names of Places.	Marriages to Births, as	Births to Burials, as
England in general	1 to 4.63	1.12 to 1
London	1 to 4	1. to 1.1
Hantshire, from 1569 to 1658	1 to 4	1.2 to 1
Tiverton in Devonshire from 1656 to 1664	1 to 3.7	1.26 to 1
Cranbrook in Kent, from 1560 to 1649	1 to 3.9	1.6 to 1
Aynho, in Northamptonshire, for 118 years	1 to 6	1.6 to 1
Upminster in Essex, for 100 years	1 to 4.6	1.8 to 1
Franckfort on the Maine, in 1695	1 to 3.7	1.2 to 1
Old, Middle, and Lower Marck, in 1698	1 to 3.7	1.9 to 1
Dominions of the Elector of Brandenburg, in 1698	1 to 3.7	1.5 to 1
Breslaw in Silesia, from 1687 to 91		1.6 to 1
Paris, in 1670, 1671, 1672	1 to 4.7	1.6 to 1

The following Table, similar to the preceding, is formed from the observations collected and referred to by Dr Price.

Names of Places.	Marriages to Births, as	Births to Burials, as
London, annual medium from 1716 to 1736	— — —	18,000 to 26,529, or 1 to 1.4, &c.
— — — from 1759 to 1768	— — —	15,710 to 22,956, or 1 to 1.4, &c.
Northampton, ditto, from 1741 to 1770	— — —	155 to 191, or 1 to 1.2, &c.
Norwich, ditto, from 1740 to 1769	— — —	1057 to 1206, or 1 to 1.1, &c.
Shrewsbury, ditto, from 1762 to 1768	— — —	301 to 329, or 1 to 1.09, &c.
Manchester and Salford, exclusive of dissenters, Ditto, from 1755 to 1759	— — —	756 to 743, — — —
Ditto, ditto, including dissenters, from 1768 to 1772	— — —	1098 to 958, or 1.14, &c. to 1.
Gainsborough in Lincolnshire, ditto, from 1752 to 1771	1 to 3.7	126 to 105, or 1.2 to 1.
Madeira, ditto, from 1759 to 1766	1 to 4.68	2201 to 1293, or 1.7 to 1.
Boston in New England, from 1731 to 1752	— — —	538 to 608, or 1 to 1.13, &c.
Christiana in Norway, in 1761	— — —	11,024 to 6929, or 1.5 to 1.
Paris, mean of some of the last years	1 to 4.3	19,100 to 19,400, or 1 to 1.01, &c.
Vienna, annual medium from 1757 to 1769	— — —	5800 to 6600, or 1 to 1.1, &c.
Amsterdam, ditto, for some of the last years	1 to 19, &c.	4600 to 8000, or 1 to 1.1, &c.
Copenhagen, ditto	1 to 3.04, &c.	2700 to 3300, or 1 to 1.2, &c.
Berlin, ditto, for five years, ending at 1759	1 to 3.9, &c.	3855 to 5054, or 1 to 1.3, &c.
Breslaw, ditto, from 1633 to 1734	— — —	1089 to 1256, or 1 to 1.15, &c.
— — —, ditto, from 1717 to 1725	— — —	1252 to 1507, or 1 to 1.2, &c.
Rome, ditto, from 1759 to 1761	— — —	5167 to 7153, or 1 to 1.3, &c.
Vaud in Switzerland, ditto, for 10 years before 1766	1 to 3.9	3155 to 2504, or 1.2, &c. to 1.

For an account of the numbers of male and female still-born children and chrysons, and of boys and girls N° 195.

under ten, of married men and married women, and of widows and widowers, who died for a course of years at

Marriage. at Vienna, Breslaw, Dresden, Leipzig, Ratibon, and some other towns in Germany, see Phil. Trans. Abr. Vol. VII. Part IV. p. 46, &c.

Chambl's
Cyclop.
Dr Rees.

The reader may find many curious calculations and remarks relating to this subject in Dr Price's excellent work, intitled, *Observations on Reversionary Payments*. From the preceding table it appears, that marriages, one with another, do each produce about four births, both in England and other parts of Europe. Dr Price observes, that the births at Paris, as may be seen in the table, are above four times the weddings; and therefore it may seem, that in the most healthy country situations, every wedding produces above four children; and though this be the case in Paris, for reasons which he has given, he has observed nothing like it in any other great town. He adds, that from comparing the births and weddings in countries and towns where registers of them have been kept, it appears, that in the former, marriages one with another seldom produce less than four children each; generally between four and five, and sometimes above five; but in towns seldom above four, generally between three and four, and sometimes under three. It is necessary to be observed here, that though the proportion of annual births to weddings has been considered as giving the true number of children derived from each marriage, taking all marriages one with another; yet this is only true, when, for many years, the births and burials have kept nearly equal. Where there is an excess of the births occasioning an increase, the proportion of annual births to weddings must be less than the proportion of children derived from each marriage; and the contrary must take place where there is a decrease: and by Mr King's computation, about one in an hundred and four persons marry; the number of people in England being estimated at five millions and a half, whereof about forty-one thousand annually marry.

In the district of Vaud in Switzerland, the married are very nearly a third part of the inhabitants.

Major Graunt and Mr King disagree in the proportions between males and females, the latter making 10 males to 13 females in London; in other cities and towns, and in the villages and hamlets, 100 males to 99 females: but Major Graunt, both from the London and country bills, computes, that there are in England 14 males to 13 females; whence he justly infers, that the Christian religion, prohibiting polygamy, is more agreeable to the law of nature than Mahometanism and others that allow it.

This proportion of males to females Mr Derham thinks pretty just, being agreeable to what he had observed himself. In the hundred years, for instance, of his own parish-register of Upminster, though the burials of males and females were nearly equal, being 633 males and 623 females in all that time; yet there were baptized 709 males and but 675 females, which is 13 females to 13.7 males.

From a register kept at Northampton for 28 years, from 1741 to 1770, it appears, that the proportion of males to females that were born in that period is 2361 to 2288, or nearly 13.4 to 13. However, though more males are born than females, Dr Price has sufficiently shown, that there is a considerable difference between the probabilities of life among males and fe-

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males in favour of the latter; so that males are more shortlived than females; and as the greater mortality of males takes place among children, as well as among males at all ages, the fact cannot be accounted for merely by their being more subject to untimely deaths by various accidents, and by their being addicted to the excesses and irregularities which shorten life. Mr Kersseboom informs us, that, during the course of 125 years in Holland, females have in all accidents of age lived about three or four years longer than the same number of males. In several towns of Germany, &c. it appears, that of 7270 married persons who had died, the proportion of married men who died to the married women was 3 to 2; and in Breslaw for eight years, as 5 to 3. In all Pomerania, during nine years, from 1748 to 1756, this proportion was nearly 15 to 11. Among the ministers and professors in Scotland, 20 married men die to 12 married women, at a medium of 27 years, or in the proportion of 5 to 3; so that there is the chance of 3 to 2, and in some circumstances even a greater chance, that the woman shall be the survivor of a marriage, and not a man; and this difference cannot be accounted for merely by the difference of age between men and their wives, without admitting the greater mortality of males. In the district of Vaud in Switzerland, it appears, that half the females do not die till the age of 46 and upwards, though half the males die under 36. It is likewise an indisputable fact, that in the beginning of life, the rate of mortality among males is much greater than among females.

From a table formed by Dr Price, from a register kept for 20 years at Gainsborough, it appears, that of those who live to 80, the major part, in the proportion of 49 to 32, are females. Mr Deparcieux at Paris, and Mr Wargentin in Sweden, have farther observed, that not only women live longer than men, but that married women live longer than single women. From some registers examined by Mr Muret in Switzerland, it appears, that of equal numbers of single and married women between 15 and 25, more of the former died than of the latter, in the proportion of 2 to 1.

With respect to the difference between the mortality of males and females, it is found to be much less in country parishes and villages than in towns; and hence it is inferred, that human life in males is more brittle than in females, only in consequence of adventitious causes, or of some particular debility, that takes place in polished and luxurious societies, and especially in great towns.

From the inequality above stated between the males and females that are born, it is reasonable to infer, that one man ought to have but one wife; and yet that every woman without polygamy may have a husband: this surplusage of males above females being spent in the supplies of war, the seas, &c. from which the women are exempt.

Perhaps, says Dr Price, it might have been observed with more reason, that this provision had in view that particular weakness or delicacy in the constitution of males, which makes them more subject to mortality; and which consequently renders it necessary that more of them should be produced, in order to preserve in the world a due proportion between the two sexes.

That this is a work of Providence, and not of chance,

Marriage

chance, is well made out by the very laws of chance by Dr Arbuthnot; who supposes Thomas to lay against John, that for 82 years running more males shall be born than females; and giving all allowances in the computation to Thomas's side, he makes the odds against Thomas, that it does not so happen, to be near five millions of millions of millions of millions to one; but for ages of ages, according to the world's age, to be near an infinite number to one.

According to Mr Kerseboom's observations, there are about 325 children born from 100 marriages.

Mr Kerseboom, from his observations, estimates the duration of marriages, one with another, as in the following Table.

Those whose ages, taken together, make

40, live together between 24 and 25 years.

50 22 23

60 23 21

70 19 20

80 17 18

90 14 15

100 12 13

Phil. Trans. N^o 468. sect. iii. p. 319.

Dr Price has shown, that on De Moivre's hypothesis, or that the probabilities of life decrease uniformly (see *COMPLEMENT of Life*), the duration of survivorship is equal to the duration of marriage, when the ages are equal; or, in other words, that the expectation of two joint lives, the ages being equal, is the same with the expectation of survivorship; and, consequently, the number of survivors, or (which is the same, supposing no second marriages) of widows and widowers, alive together, which will arise from any given set of such marriages constantly kept up, will be equal to the whole number of marriages; or half of them (the number of widows in particular) equal to half the number of marriages. Thus, the expectation of two joint lives, both 40, is the third of 46 years, or their complement, *i. e.* 15 years and 4 months; and this is also the expectation of the survivor. That is, supposing a set of marriages between persons all 40, they will one with another last just this time, and the survivors will last the same time. In adding together the years which any great number of such marriages, and their survivorships, have lasted, the sums would be found to be equal. It is observed farther, that if the number expressing the expectation of single or joint lives, multiplied by the number of single or joint lives whose expectation it is, be added annually to a society or town, the sum gives the whole number living together, to which such an annual addition would in time grow: thus, since 19, or the third of 57, is the expectation of two joint lives whose common age is 29, or common complement 57, 20 marriages every year between persons of this age would in 57 years grow to 20 times 19, or 380 marriages always existing together. The number of survivors also arising from these marriages, and always living together, would in twice 57 years increase to the same number. Moreover, the particular proportion that becomes extinct every year, out of the whole number constantly existing together of single or joint lives, must, wherever this number undergoes no variation, be exactly the same with the expectation of those lives at the time when their existence commenced. Thus, if it were

found that a 19th part of all the marriages among any body of men, whose numbers do not vary, are dissolved every year by the deaths of either the husband or wife, it would appear, that 19 was at the time they were contracted, the expectation of these marriages. Dr Price observes, that the annual average of weddings among the ministers and professors in Scotland for the last 27 years has been 31; and the average of married persons for 17 years ending in 1767, had been 667. This number, divided by 31, gives 21½, the expectation of marriage among them; which, he says, is above 2½ years more than the expectation of marriage would be, by Dr Halley's table, on the supposition, that all first, second, and third marriages, may be justly considered as commencing one with another so early as the age of 30; and he has proved, that the expectation of two equal joint lives is to the expectation of a single life of the same age as 2 to 3: consequently, the expectation of a single life at 30, among the ministers in Scotland, cannot be less than 32.25. If we suppose the mean ages of all who marry annually to be 33 and 25, the expectation of every marriage would be 19 years; or one with another they would be all extinct in 19 years: the marriages which continue beyond this term, though fewer in number, enjoying among them just as much more duration as those that fall short of it enjoy less. But it appears from the observations and tables of Mr Muret, that, in the district of Vaud (dividing half the number of married persons, *viz.* 38,328, by the annual medium of weddings, *viz.* 808), the expectation of marriage is only 23½ years: so much higher are the probabilities of life in the country than in towns, or than they ought to be, according to De Moivre's hypothesis.

MARRIAGE (*Maritagium*), in law, signifies not only the lawful joining of man and wife, but also the right of bestowing a ward or a widow in marriage, as well as the land given in marriage.

Dissolution of MARRIAGE. See DIVORCE.

Forcible MARRIAGE. See FORCIBLE Marriage.

Frank MARRIAGE. See FRANK.

Jactitation of MARRIAGE, in law, is one of the first and principal matrimonial causes, when one of the parties boasts or gives out, that he or she is married to the other, whereby a common reputation of their matrimony may ensue. On this ground the party injured may libel the other in the spiritual court; and unless the defendant undertakes and makes out a proof of the actual marriage, he or she is enjoined perpetual silence on that head; which is the only remedy the ecclesiastical courts can give for this injury.

MARRIAGE Settlement, is a legal act, previous to marriage, whereby a jointure is secured to the wife after the death of the husband. These settlements seem to have been in use among the ancient Germans, and their kindred nation the Gauls. Of the former Tacitus gives us this account: *Dotem non uxor marito, sed uxori maritus offert: intersunt parentes et propinqui, et munera probant* (De Mor. Germ. c. 18.) And Cæsar, De Bell. Gallic. lib. vi. c. 18. has given us the terms of a marriage settlement among the Gauls, as nicely calculated as any modern jointure: *Viri, quantas pecunias ab uxoribus dotis nomine acceperunt, tantas ex suis bonis, aestimatione facta, cum dotibus communicant. Hujus omnis pecunia conjunctim ratio habetur, fructusque servatur.*

Marriage *Uter eorum vita superavit, ad eum pars utriusque cum fructibus superiorum temporum pervenit.* The dauphin's commentator supposes that this Gaulish custom was the ground of the new regulations made by Justinian, Nev. 97. with regard to the provision for widows among the Romans; but surely there is as much reason to suppose, says Judge Blackstone, that it gave the hint for our statutable jointures. Comment. vol. ii. p. 138.

See an excellent marriage settlement by Blackstone in the appendix to the second volume of his Commentaries.

Duty of MARRIAGE, is a term used in some ancient customs, signifying an obligation on women to marry.

To understand this, it must be observed, that old maids and widows about sixty, who held fees in body, or were charged with any personal or military services, were anciently obliged to marry, to render those services to the lord by their husbands, or to indemnify the lord for what they could not do in person. And this was called *duty* or *service of marriage*.

Policy of encouraging MARRIAGE. Dr Halley observes, that the growth and increase of mankind is not so much stunted by any thing in the nature of the species, as it is from the cautious difficulty most people make to adventure on the state of marriage, from the prospect of the trouble and charge of providing for a family; nor are the poorer sort of people herein to be blamed, who, besides themselves and families, are obliged to work for the proprietors of the lands that feed them; and of such does the greater part of mankind consist. Were it not for the backwardness to marriage, there might be four times as many births as we find; for by computation from the table given under the article MORTALITY, there are 15,000 persons above 16 and under 45, of which at least 7000 are women capable of bearing children; yet there are only 1238, or little more than a sixth part of these, that breed yearly: whereas, were they all married, it is highly probable that four of six should bring forth a child every year, the political consequences of which are evident. Therefore, as the strength and glory of a kingdom or state consists in the multitude of subjects, celibacy above all things ought to be discouraged, as by extraordinary taxing or military service: and, on the contrary, those who have numerous families should be allowed certain privileges and immunities, like the *jus trium liberorum* among the Romans; and especially, by effectually providing for the subsistence of the poor.

MARROW, in anatomy, a soft oleaginous substance contained in the cavity of the bones. See ANATOMY, n° 5.

MARRUBIUM, WHITE HOREHOUND: A genus of the gymnospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 42d order, *Verticillate*. The calyx is salver-shaped, rigid, and ten-friated; the upper lip of the corolla bifid, linear, and straight. There are nine species, the most remarkable of which is the vulgare, a native of Britain, growing naturally in waste places, and by way-sides near towns and villages, but not common. It has a strong and somewhat musky smell, and bitter taste. It is reputed attenuant and resolvent; an infusion of the leaves in water, sweetened with honey, is recom-

mended in asthmatical and phthical complaints, and most other diseases of the breast and lungs.

MARS, in astronomy, one of the five planets, and of the three superior ones; its place being between the earth and Jupiter. See ASTRONOMY, n° 40.

MARS, in Pagan worship, the god of war. He was, according to some, the son of Jupiter and Juno; while others say that he was the son of Juno alone, who, being displeased at Jupiter's having produced Minerva from his brain, without female aid, in revenge conceived without the assistance of the other sex, by touching a flower shown to her by Flora in the plains of Olenus, and became the mother of this formidable deity. The amours of Mars and Venus, and the manner in which Vulcan caught and exposed them to the laughter of the other gods, have been described by several of the ancient poets. He is represented as having several wives and mistresses, and a considerable number of children. He was held in the highest veneration by the Romans, both from his being the father of Romulus their founder, and from their inclination to conquest; and had magnificent temples erected to him at Rome.

Mars is usually represented in a chariot, drawn by furious horses. He is completely armed; and extends his spear with the one hand, and grasps a sword, imbrued in blood, with the other. He has a fierce and savage aspect. Discord is represented preceding his car; and Clamour, Fear, and Terror, appear in his train. The victims sacrificed to him were the wolf, the horse, the wood-pecker, the vulture, and the cock.

MARS, among chemists, denotes *iron*; that metal being supposed to be under the influence of the planet Mars.

MARSAIS (Cesar Chesneau du), was born at Marseilles 1676. He attached himself at an early period of life to the order of the congregation of the oratory; but the situation was too narrow for his genius, and he soon left it. At Paris he married, became advocate, and entered on this new profession with great success and approbation. Disappointed, however, in his expectations of making a speedy fortune, he abandoned the law also. About this time the peevish humour of his wife occasioned a separation. We next find him as governor to the son of the president de Maisons; and when the premature death of the father deprived him of the fruits of his industry, he engaged with the famous Law in the same capacity. After the fall of this extraordinary projector, he completed the education of the Marquis de Beaufremont's children, and reared pupils worthy of his genius and industry. Although he was accused of a tendency to Deism, and though there was good reason for the accusation; yet he never infused into the minds of his scholars any principle inconsistent with sound morality, or with the Christian religion. When he left M. de Beaufremont's family, he took a boarding house, in which, after a method of his own, he educated a certain number of young men. Unexpected circumstances obliged him to abandon this useful undertaking. He was even constrained to give some occasional lessons for the bare necessities of life. Without fortune, without hope, and almost without resource, he was reduced to extreme indigence.

Mars,
Marsais.

Marfais.

digence. In this situation he was found by the authors of the *Encyclopédie*, and made a partner in conducting that great work. Among many other excellent pieces, the article *Grammar* breathes the spirit of sound philosophy. His principles are clear and solid. He discovers an extreme knowledge of the subject, great accuracy in the rules, and great propriety in the application. M. le Comte de Lauraguais was so much affected with the distresses, and so much convinced of the merit of *Du Marfais*, that he procured him a pension of one thousand livres. Du Marfais died at Paris on the 11th June 1756, in his eightieth year, after having received the sacrament. The compliment which he paid to the priest on this occasion has been considered by some as rather equivocal. But there is no necessity to deprive religion of this triumph, or philosophy of that honour which conviction and penitence must confer on it. "The faith of a great genius (says Bayle, who is intitled to credit on this subject) is not totally extinguished: It is like a spark under the ashes. Reflection and the prospect of danger call forth its exertions. There are certain situations in which philosophers are as full of anxiety and remorse as other men." Whatever were the last sentiments of Du Marfais, it cannot be denied that in the vigour of health he furnished several examples of irreligion, and to these have been added many absurd stories. The superiority of Du Marfais's talents consisted in exactness and perspicuity. His ignorance of the world, and of the customs of mankind, together with the greatest latitude in expressing whatever he thought, gave him that frank and unguarded simplicity which is often the chief ingredient of genuine humour. Fontenelle used to say of him, "that he was the most lively simpleton, and as a man of wit the most simple, he ever knew." He was the Fontaine of philosophers. In consequence of this character, he was a nice judge of what was natural in every production, and a great enemy to all kind of affectation. His principal works are, 1. *Exposition de la doctrine de l'Eglise Gallicane par rapport aux prétensions de la Cour de Rome*, 12mo. This accurate work was begun at the desire of the president de Maisons, and did not appear till after the death of the author. 2. *Exposition d'une methode raisonnée pour apprendre la langue Latine*, 12mo, 1722, rare. This method appears conformable to the natural unfolding of the powers of the mind, and on that account renders the acquisition of the language less difficult; but it was liable to two great objections to vulgar and unenlightened understandings, namely, its novelty, and the censure which it conveyed against the former method. 3. *Traité des tropes*, 1730, 8vo; again printed in 1771, 12mo. This work is intended to explain the different significations of the same word. It is a master-piece of logic, of accuracy, of perspicuity, and precision. The observations and the rules are illustrated by striking examples calculated to show both the use and the abuse of the rhetorical figures. It is wonderful at the same time that this excellent book had very little sale, and is scarcely known. A gentleman who wanted to compliment the author on this extraordinary performance, told him that he had heard a great deal of his *Histoire des Tropes*, and begged to know in what particular part of the world the nation flourished. 4. *Les véritables Principes de la Grammaire raisonnée pour apprendre la langue Latine*,

1729, 4to. There was only the preface of this work published, in which he introduced the greatest part of his *methode raisonnée*. 5. *Labiege de la fable du Pere Jouvenci*, arranged after the manner of the original plan, 1731, 12mo. 6. *Une réponse manuscrite a la Critique de l'histoire des oracles par le Pere Baltus*. There are only imperfect fragments of these papers to be found.— 7. *Logique, ou réflexions sur les opérations de l'esprit*. This is a short tract, which nevertheless contains every thing necessary to be known on the art of reasoning. It was reprinted at Paris, in two parts, together with the articles which he had furnished for the *Encyclopédie*, 1762. We shall altogether omit several other performances, calculated to disseminate the principles of Deism or profanity; which, though they are published in his name, may be spurious, and at any rate deserve not to be drawn from that oblivion into which they have fallen.

MARSAL, a town of France, in Lorrain, remarkable for its salt-works; seated in a marsh on the river Selle, of difficult access, which, together with the fortifications, render it an important place. E. Long. 6. 43. N. Lat. 48. 46.

MARSALA, an ancient and strong town of Sicily, in the valley of Mazara. It is well peopled, and built on the ruins of the ancient Lilybœum. E. Long. 12. 37. N. Lat. 37. 52.

MARSAN, or MOUNT-MARSAN, a town of France, in Gascony, and capital of a small territory of the same name, fertile in wine; seated on the river Miduse, in W. Long. 0. 39. N. Lat. 44. 0.

MARSAQUIVER, or MARSALQUIVER, a strong and ancient town of Africa, on the coast of Barbary, and in the province of Beni-Arax, in the kingdom of Tremesen, with one of the best harbours in Africa. It was taken by the Spaniards in 1732. It is seated on a rock near a bay of the sea, in W. Long. 0. 10. N. Lat. 35. 40.

MARSEILLES, a strong sea-port, and the richest town of Provence, in France. Here is a good harbour, where the French galleys are stationed; for it will not admit large men of war. The entrance of the harbour, which is extremely narrow and surrounded by lofty mountains, protects and shelters vessels during the most violent storms. The port itself forms a delightful walk even in the middle of winter, as it is open to the southern sun, and crowded with vast numbers of people not only of all the European nations, but of Turks, Greeks, and natives of the coast of Barbary. The whole scene is one of the most agreeable that can be imagined, if the chains of the galley slaves heard among the hum of business did not tincture it with the hateful idea of slavery. The galleys themselves, useless and neglected, rot peaceably in their respective stations; and it is said that no others will ever be constructed to supply their place, as they have long ceased to be of any utility to the state, and are scarcely even navigable in severe weather. Marseilles pretends to the most remote antiquity; a colony of Phocians, in ages unknown, having given it birth. It is divided into the Old Town and the New; which are separated by a street, bordered with trees on each side. The Old Town is one of the most ill built of any in Europe. The New has sprung up since the commencement of the 18th century, and has all that

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Marseilles.

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Marshall.

that regularity, elegance, and convenience, which distinguish the present times. It is said to contain 100,000 inhabitants, and is one of the most trading towns in France. Without the walls is the castle of Notre-Dame, which is very well fortified. It is a bishop's see, and there is a French academy; it having been noted at all times for men of learning. In 1660, Louis XIV. built the citadel and fort St John to keep the inhabitants in awe, because they pretended to be free. The Jesuits had a very fine observatory here; and in the arsenal, built not long ago, there are arms for 40,000 men. In the House of Discipline they weave gold, silver, and silk brocades. The drugs are brought thither from all parts of the world. It is seated on the north shore of the Mediterranean, in E. Long. 4. 27. N. Lat. 43. 18. The surrounding country is rocky and barren, but covered for several miles on all sides with villas and summer houses, which commerce has erected.

MARSH (Narcissus), an exemplary Irish prelate, born at Hannington in Wiltshire in 1638. He was made principal of St Alban's hall, Oxford, in 1673, but removed to the provostship of Dublin college in 1678. He was promoted to the bishopric of Leighlin and Ferns in 1682, translated to the archbishopric of Cashel in 1690, to Dublin in 1694, and to Armagh in 1703. While he held the see of Dublin, he built a noble library for the use of the public, filled it with choice books, and settled a provision for two librarians. He repaired, at his own expence, several decayed churches, besides buying in and restoring many impropriations, and presenting a great number of oriental MSS. to the Bodleian library. He was a very learned and accomplished man; was well versed in sacred and profane literature, in mathematics, natural philosophy, the learned languages, especially the oriental, and in both the theory and practice of music. He published, 1. *Institutiones logicae*.—2. *Manuductio ad logicam*, written by Philip de Trieu; to which he added the Greek text of Aristotle, and some tables and schemes. 3. An introductory essay on the doctrine of sounds, &c. He died in 1713.

MARSH, signifies a piece of ground flowed with water, yet so that the grass and other vegetables rise above the surface of the water, and, by their decaying, give rise to putrid effluvia, which are very pernicious to the human body.

MARSHAL, or MARESCHAL, (*marescallus*), primarily denotes an officer who has the care or the command of horses.—Nicod derives the word from *polemarchus*, "master of the camp;" Matthew Paris from *Martis senescallus*. In the old Gaulish language, *march* signified "horse;" whence *marechal* might signify "him who commanded the cavalry." Other derivations have been given by different authors; and the name itself has been applied to officers of very different employments.

MARSHAL of France, the highest dignity of preferment in the French armies. The dignity of marshal came to be for life, though at its first institution it was otherwise. They were then only the king's first ecuyers under the constable; but in time they became the constable's lieutenants in the command of the army, the constable himself being then become cap-

tain-general. At first they were but two in number; and their allowance was but 500 livres *per annum* in time of war, and nothing in time of peace: but in the reign of Francis I. a third was added; Henry II. created a fourth. Since it has been various; Louis XIV. increased it to 20. Their office at first was, to marshal the army under the constable, and to command in his absence. They did then what the *marshals de camp* do now; to which last they have given their title, and the least considerable part of their authority.

Earl MARSHAL of Scotland. His office was to command the cavalry, whereas the CONSTABLE commanded the whole army. They seem, however, to have had a sort of joint command, as of old all orders were addressed "to our constable and marischal." The office of earl marischal has never been out of the noble family of Keith. It was reserved at the union; and when the heritable jurisdictions were bought, it was in the crown, being forfeited by the rebellion of Geo. Keith, earl marischal, in 1715.

Earl MARSHAL of England is the eighth great officer of state. This office, until it was made hereditary, always passed by grant from the king, and never was held by tenure or serjeanty (by any subject) as the offices of lord high steward and lord high constable were sometimes held. The title is personal, the office honorary and officary. They were formerly styled *lord marshal* only, until king Richard II. June 20. 1397, granted letters-patent to Thomas Mowbray, earl of Nottingham, and to the heirs male of his body lawfully begotten, by the name and style of *earl marshal*; and further, gave them power to bear in their hand a gold truncheon, enamelled with black at each end; having at the upper end of it the king's arms engraven thereon, and at the lower end his own arms.

King James I. was pleased, by letters-patent, dated August 29th 1622, to constitute Thomas Howard, earl of Arundel and Surrey, earl marshal for life; and the next year, the same king granted (with the advice of the privy-council) letters-patent, wherein it was declared, that during the vacancy of the office of lord high constable of England, the earl marshal had the like jurisdiction in the court of chivalry, as both constable and marshal jointly ever exercised. See CHIVALRY (*Court of*.)

On the 19th of October 1672, king Charles II. was pleased to grant to Henry lord Howard, and the heirs-male of his body lawfully begotten, the office and dignity of earl marshal of England, with power to execute the same by deputy or deputies, in as full and ample a manner as the same was heretofore executed by Henry Howard, lord Maltravers, late earl of Arundel, Surrey, and Norfolk, grandfather to the said Henry lord Howard; or by Thomas Howard late duke of Norfolk, grandfather to the said Thomas Howard, late earl of Arundel, Surrey, and Norfolk; or by Thomas Howard duke of Norfolk, grandfather of the said Thomas Howard duke of Norfolk; or by John Mowbray duke of Norfolk, or any other earl marshal of England; with a pension of L. 20 each year, payable out of the Hanaper office in chancery; and on default of the issue-male of the said Henry lord Howard,

Marshall.

Marshall
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Marshalsea.

Howard, with limitation to the heirs-male lawfully begotten of the body of the said Thomas Howard, earl of Arundel, &c.; and, on the default of such issue, to descend in like manner to the heirs-male of Thomas late earl of Suffolk; and, on default of his issue-male, to the heirs-male of lord William Howard, late of Naworth in the county of Cumberland, youngest son to Henry Howard late duke of Norfolk; and, on default of his issue-male, to Charles Howard earl of Nottingham, and the heirs-male of his body lawfully begotten.

Field-MARSHAL, an office of high rank in the European armies. It is now, however, disused in the British army; Lord Tyrawley was the last, appointed in 1763.

Knight MARSHAL, or *MARSHAL of the King's House*, an English officer, whose business, according to Fleta, is to execute the commands and decrees of the lord steward, and to have the custody of prisoners committed by the court of verge. Under him are six marshal's men, who are properly the king's bailiffs, and arrest in the verge of the court, when a warrant is backed by the board of green-cloth. The court where causes of this kind, between man and man, are tried, is called the *Marshalsea*, and is under the knight-marshal. See *MARSHALSEA*.

This is also the name of the prison in Southwark; the reason of which may probably be, that the marshal of the king's house was wont to sit there in judgment, or keep his prison.

MARSHAL of the King's Bench, an officer who has custody of the prison called the *King's Bench* in Southwark.—He gives attendance upon the court, and takes into his custody all prisoners committed by the court; he is fineable for his absence, and non-attendance incurs a forfeiture of his office. The power of appointing the marshal of the king's bench is in the crown.

In Fleta, mention is also made of a *marshal of the exchequer*, to whom the court commits the custody of the king's debtors, &c.

MARSHAL (Thomas), a very learned English divine in the 17th century, was educated at Oxford. This city being garrisoned upon the breaking out of the civil wars, he bore arms for the king. Afterward he had several successive preferments in the church; and died at Lincoln-college, of which he was rector. By his will he left all his books and MSS. to the university of Oxford, and money to Lincoln-college for the maintenance of three scholars. He was a noted critic, especially in the Gothic and English-Saxon tongues; and eminent for his piety and other valuable qualities. He wrote, 1. *Observationes in Evangeliorum versiones per antiquos duos, Goth. scilicet & Anglo-Sax.* &c. 2. *Notes on the church-catechism*, &c.

MARSHALLING a COAT, in heraldry, is the disposal of several coats of arms belonging to distinct families in one and the same escutcheon or shield, together with their ornaments, parts, and apurtenances. See *HERALDRY*, chap. vi. p. 466.

MARSHALSEA (*the Court of*), and the *Palace-court* at Westminster, though two distinct courts, are frequently confounded together. The former was originally holden before the steward and marshal of the king's house; and was instituted to administer justice between the king's domestic servants, that they

might not be drawn into other courts, and thereby the king lose their service. It was formerly held in, though not a part of, the *aula regis*; and, when that was subdivided, remained a distinct jurisdiction: holding plea of all trespasses committed within the verge of the court, where only one of the parties is in the king's domestic service (in which case the inquest shall be taken by a jury of the country); and of all debts, contracts, and covenants, where both of the contracting parties belong to the royal household; and then the inquest shall be composed of men of the household only. By the statute of 13 Ric. II. ft. 1. c. 3. (in affirmance of the common law), the verge of the court in this respect extends for 12 miles round the king's place of residence. And, as this tribunal was never subject to the jurisdiction of the chief justiciary, no writ of error lay from it (though a court of record) to the king's-bench, but only to parliament, till the statutes of 5 Edw. III. c. 2. and 10 Edw. III. ft. 2. c. 3. which allowed such writ of error before the king in his place. But this court being ambulatory, and obliged to follow the king in all his progresses, so that by the removal of the household actions were frequently discontinued, and doubts having arisen as to the extent of its jurisdiction, king Charles I. in the sixth year of his reign, by his letters-patent, erected a new court of record, called the *curia palatii*, or *palace-court*, to be held before the steward of the household and knight-marshal, and the steward of the court, or his deputy; with jurisdiction to hold plea of all manner of personal actions whatsoever, which shall arise between any parties within 12 miles of his majesty's palace at Whitehall. The court is now held once a week, together with the ancient court of marshalsea, in the borough of Southwark: and a writ of error lies from thence to the court of king's-bench. But if the cause is of any considerable consequence, it is usually removed on its first commencement, together with the custody of the defendant, either into the king's-bench or common-pleas by a writ of *habeas corpus cum causa*: and the inferior business of the court hath of late years been much reduced, by the new courts of conscience erected in the environs of London; in consideration of which the four counsel belonging to these courts had salaries granted them for their lives by the stat. 23. Geo. II. c. 27.

MARSHAM (Sir John), a very learned English writer in the 17th century. He studied the law in the Middle-Temple, and was sworn one of the six clerks in the court of chancery in 1638. In the beginning of the civil wars he followed the king to Oxford; for which he was sequestered of his place by the parliament at Westminster, and plundered. After the declining of the king's affairs, he returned to London; compounded, among other royalists, for his real estate; and betook himself wholly to his studies and a retired life, the fruits of which were some excellent works. He wrote *Diatriba Chronologica*; *Chronicus Canon*, *Ægyptiacus*, *Ebraicus*, *Græcus*, &c. He died in 1685.

MARSHFIELD, a town of Gloucestershire, 7 miles from Bath, 12 from Chipping-Sodbury, 12½ from Bristol, 35 from Gloucester, and 104 from London, on the road to Bristol, and on the very borders of Wilts. It is a considerable clothing-town, drives

Marshalsea
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Marshfield.

Marshland a good trade in malt, and is famous for cakes. It consists chiefly of one street of old buildings near a mile long; and is governed by a bailiff. It has a large church, with a well-endowed alms-house and a chapel to it for eight poor people, and a charity-school; and it has a weekly market and two fairs.

MARSHLAND, a marshy peninsula in the county of Norfolk, opposite to King's-Lynn, almost surrounded with the Ouse and other navigable rivers, and an arm of the sea. It seems formerly to have been recovered out of the ocean, from whose inundations it could never be altogether defended; and in Sir Henry Spelman's time it suffered two general ones, viz. one from the salt-water, the other from the freshes; by the last of which the inhabitants suffered 42,000 l. damage. It contains about 30,000 acres, which turn to more profit by grazing than ploughing. It is about 10 miles in the widest place, and has no less than 111 brick bridges. The commonage of it belongs to seven villages that surround it. The air is so unhealthy, that an ague is commonly called the *Marshland-bailiff*.

MARSHMALLOW, in botany. See *ALTHÆA*.

MARSI, a nation of Germany, who afterwards came to settle in Italy, where they occupied the territory in the environs of the Fucine Lake. They at first proved very inimical to the Romans, but in process of time they became its firmest supporters. They were allowed by the Romans to be the most intrepid soldiers of their legions when in friendship, and the most formidable of their enemies when at variance; and it was a common saying, that Rome could neither triumph over the Marfi nor without them. They are particularly celebrated for the civil war in which they were engaged, and which from them has received the name of the *Marfian war*. The large contributions they made to support the interest of Rome, and the number of men which they continually supplied to the republic, rendered them bold and aspiring; and they claimed, with the rest of the Italian states, a share of the honour and privileges which were enjoyed by the citizens of Rome. This petition, though supported by the interest, the eloquence, and the integrity of the tribune Drusus, was received with contempt by the Roman senate; upon which, in the 662d year of Rome, the Marfi put themselves at the head of the social war, one of the most obstinate and dangerous oppositions ever made to the progress of the Roman power. They obtained several victories: but they were at last defeated: though the war was not terminated but by a grant of those privileges for which they contended.

MARSICO NUOVO, a small, rich, and handsome town of Italy, in the kingdom of Naples, and in the Hither Principato, with a bishop's see. It is seated at the foot of the Apennines, near the river Agri, in E. Long. 15. 49. N. Lat. 20. 42.

MARSIGLI (Lewis Ferdinand, count), an Italian famous for letters as well as arms, was descended from an ancient and noble family, and born at Bologna in 1658. He acquired a great knowledge in the art of war and fortification; served under the emperor Leopold II. against the Turks, by whom he was taken prisoner in 1683 but redeemed, after a year's captivity. In the Spanish succession war, Mar-

figli, then advanced to the rank of marshal, being in the fortress of Brisac, which surrendered to the duke of Burgundy in 1703, when the place was deemed capable of holding out much longer, was stripped of all his commissions, and had his sword broke over him; and the count d'Arco who commanded was beheaded. Marsigli now sought for consolation in the sciences; as, amidst all the hurry and fatigue of war, he had made all the advantages the most philosophic man could do, who had travelled purely in quest of knowledge. He had a rich collection of every thing proper to the advancement of natural knowledge, instruments astronomical and chemical, plans of fortifications, models of machines, &c. all which he presented to the senate of Bologna by an authentic act in 1712, forming at the same time out of them what he called *the institute of the arts and sciences at Bologna*. He also founded a printing-house, and furnished it with the best types for Latin, Greek, Hebrew, and Arabic, which he presented in 1728 to the Dominicans at Bologna, on condition of their printing all the writings of the *institute* at prime cost: this was called *the printing-house of St Thomas Aquinas*. His writings on philosophical subjects are numerous and valuable, in Latin, Italian, and French: he died in 1730.

MARSTON (John), an English dramatic writer, who lived in the time of James I. Wood says he was a student in Corpus Christi college, Oxford; but we neither know his family nor the time of his birth. He contributed eight plays to the stage, which were all acted at Black-friars with applause; and one of them, called the *Dutch Courtesan*, was once revived since the Restoration, under the title of the *Revenge*, or a *Match in Newgate*. There is no account when he died; but we find his works were published after his death by Shakespeare, and may thence reasonably conclude that it happened about the year 1614. He was a chaste and pure writer; avoiding all that obscenity, ribaldry, and scurrility, which too many of the play-wrights of that time, and indeed much more so in some periods since, have made the basis of their wit, to the great disgrace and scandal of the stage.

MARSYAS (fab. hist.), a celebrated musician of Celæne in Phrygia, son of Olympus, or of Hyagnis, or Cægrus. He was so skilful in playing on the flute, that he is generally deemed the inventor of it. According to the opinion of some, he found it when Minerva had thrown it aside on account of the distortion of her face when she played upon it. Marsyas was enamoured of Cybele, and he travelled with her as far as Nyssa, where he had the imprudence to challenge Apollo to a trial of his skill as a musician. The god accepted the challenge, and it was mutually agreed that he who was defeated should be fled alive by the conqueror. The Muses, or (according to Diodorus) the inhabitants of Nyssa, were appointed umpires. Each exerted his utmost skill, and the victory with much difficulty was adjudged to Apollo. The god upon this tied his antagonist to a tree, and fled him alive: (See *APOLLO*.) The death of Marsyas was universally lamented; the Fauns, Satyrs, and Dryads, wept at his fate; and from their abundant tears arose a river of Phrygia, well known by the name of *Marsyas*.

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Marsyas.

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Martha.

fyas. The unfortunate Marfyas is often represented on monuments, as tied with his hands behind his back to a tree, while Apollo stands before him with his lyre in his hands. In independent cities, among the ancients, the statue of Marfyas was generally erected in the forum, to represent the intimacy which subsisted between Bacchus and Marfyas as the emblems of liberty. At Celænæ, the skin of Marfyas was shown to travellers for some time. It was suspended in the public place, in the form of a bladder or a foot ball.

The sources of the Marfyas were near those of the Mæander, and those two rivers had their confluence a little below the town of Celænæ.

MART, a great fair held every year for buying and selling goods. Public marts, or places of buying and selling, such as markets and fairs, with the tolls thereunto belonging, can only be set up by virtue of the king's grant, or by long and immemorial usage and prescription, which presupposes such a grant. The limitation of these public resorts, to such time and place as may be most convenient for the neighbourhood, forms a part of economics, or domestic polity; which, considering the kingdom as a large family, and the king as the master of it, he has clearly a right to dispose and order as he pleases.

MARTABAN, a province of Asia, in the kingdom of Pegu, lying in the gulph of Bengal. It is a country that produces rice and all kinds of fruits proper to the climate. It has mines of several sorts of metals, and carries on a great trade. The chief town, which is of the same name, is rich, handsome, and very populous, with a good harbour. E. Long. 97. 50. N. Lat. 15. 35.

MARTEAU, the name given by French naturalists to a peculiar species of oysters, called also *malleam* by others. It is one of the most curious shells in the world. Its figure is that of a hammer, with a very long head, or rather of a pick-ax. It has a body of moderate thickness, and two long arms. It is of a brownish colour, with a beautiful tinge of a violet-blue. Notwithstanding the strange shape of these shells, they close very exactly.

MARTHA (St), a province of South America, on the coast of Terra Firma, bounded on the north by the North Sea, on the east by Rio de la Hache, on the south by New-Granada, and on the west by Carthagena. It is 300 miles in length and 200 in breadth, is a mountainous country, and the land very high. Here begins the famous ridge of mountains called the *Cordilleras des los Andes*, which run from north to south the whole length of the continent of South America. It is extremely hot on the sea-coast; but cold in the internal parts, on account of the mountains. It abounds with the fruits proper to the climate; and there are mines of gold and precious stones, as also salt-works. The Spaniards possess but one part of this province, in which they have built Martha the capital. The air about the town is wholesome; and is seated near the sea, having a harbour surrounded with high mountains. It was formerly very considerable when the galleons were sent thither, but is now come almost to nothing. W. Long. 74. 11. N. Lat. 11. 20.

MARTHA (St), or *Sierra Nevada*, a very high mountain in New Spain. Some say it is 100 miles in N^o 195.

circumference at the bottom, and five miles in height. The top is always covered with snow in the hottest weather; and the French affirm, that they can perceive it from the island of St Domingo, which is 370 miles distant. W. Long. 74. 35. N. Lat. 8. 0.

MARTHA'S Vineyard, an island of North America near the coast of New-England, 80 miles south of Boston. The inhabitants apply themselves chiefly to their fisheries, in which they have great success. W. Long. 70. 35. N. Lat. 41. 0.

MARTIAL, is sometimes used to express preparations of iron, or such as are impregnated therewith; as the martial regulus of antimony, &c.

MARTIAL-Court. See COURT-Martial.

MARTIAL Law, is the law of war that depends upon the just but arbitrary will and pleasure of the king, or his lieutenant: for though the king doth not make any laws but by common consent in parliament, yet, in time of war, by reason of the necessity of it to guard against dangers that often arise, he useth absolute power, so that his word is a law. *Smith de Repub. Ang. lib. 2. c. 4.*

But the martial law (according to Chief Justice Hale), is in reality not a law, but something indulged rather than allowed as a law; and it relates only to members of the army, being never intended to be executed on others, who ought to be ordered and governed by the laws to which they are subject, though it be a time of war. And the exercise of martial law, whereby any person might lose his life, or member, or liberty, may not be permitted in time of peace, when the king's courts are open for all persons to receive justice.

MARTIALIS (Marcus Valerius), a famous Latin poet, born at Bilbilis, now called *Bubiera*, in the kingdom of Arragon in Spain, was of the order of knights. He went to Rome at the age of 21, and staid there 35 years, under the reign of Galba and the succeeding emperors, till that of Trajan; and having acquired the esteem of Titus and Domitian, he was created tribune. At length, finding that he was neglected by Trajan, he returned to his own country Bilbilis, where he married a wife, and had the happiness to live with her several years. He admires and commends her much, telling her that she alone was sufficient to supply the want of every thing he enjoyed at Rome. "*Romam tu mihi sola facis*," says he, in the 21st epigram of the 12th book. She appears likewise to have been a lady of a very large fortune; for, in the 31st epigram of the same book, he extols the magnificence of the house and gardens he had received from her, and says that she had made him a little kind of monarch."

Munera sunt domino: post septima lustra reverso,

Has Marcella domos, parvaque regna dedit.

There are still extant 14 books of his epigrams, filled with points, a play upon words, and obscenities. The style is affected. However, some of his epigrams are excellent; many of them are of the middling kind; but the greatest part of them are bad: so that Martial never spoke a greater truth, than when he said of his own works,

Sunt bona, sunt quedam mediocra, sunt mala plura.

There is also attributed to him a book on the spectacles of the amphitheatre; but the most learned critics

Martha
||
Marialis.

Martigues, ties think that this last work was not written by *Martial*. The best editions of *Martial* are, that in *Usum Delphini*, 4to, Paris, 1617, and that *cum Notis Variorum*.

MARTIGUES, a sea-port town of France, in Provence, with the title of a principality; seated near a lake 12 miles long and five broad, which is navigable throughout, and from whence they get excellent salt. E. Long. 4. 20. N. Lat. 43. 38.

MARTIN (St.), was born at Sabaria in Pannonia, (at present *Stain* in Lower Hungary), in the beginning of the fourth century. His father was a military tribune; and he himself was obliged to carry arms, although peace and solitude were much more agreeable to his inclination. He was remarkable for every virtue, in a profession which is generally considered to give a sanction to vice. He divided his coat with a naked wretch whom he met at the gate of Amiens; and it is reported, that Jesus Christ appeared to him on the night following, clothed in this half of his coat. Martin was then a catechumen; but he soon afterwards received baptism, and renounced the military profession for the ecclesiastical. After passing many years in solitude, St Hilary bishop of Poitiers gave him the power to cast out devils. On his return to Pannonia, he persuaded his mother to embrace Christianity; and with great zeal and activity opposed the Arians, who governed the church in Illyria. When he was publicly whipt for giving testimony to the divinity of Christ, he bore the punishment with the constancy and patience of the first martyrs. This illustrious champion for Christianity, when he heard that St Hilary was returned from banishment, went and settled in the neighbourhood of Poitiers. In this retirement, a great number of monks placed themselves under his direction. His virtues became every day more splendid and remarkable, till he was drawn from his solitude, and with the general approbation of the clergy and people elected bishop of Tours in the year 374. To the zeal and charity of a bishop, he joined the humility and poverty of an anchorite. That he might detach himself more from the world, he built the celebrated monastery of Marmoutier, which still remains, and which is believed to be the oldest abbey in France. It is situated near the city of Tours, betwixt the Loire and a steep rock. In this situation, together with 80 monks, St Martin displayed the most exemplary sanctity and mortification, nor were there any monks better disciplined than those of Marmoutier. After he had converted his diocese to the Christian faith, he became the apostle of all Gaul. He diffused the doctrines of Christianity among the heathens, destroyed their temples, and (according to the writers of his life) confirmed the truth by an infinite number of miracles. The emperor Valentinian, at that time in Gaul, received him with every mark of respect and honour. The tyrant Maximus, who had revolted against the emperor Gratian, and seized on Spain, England, and Gaul, received him in a manner no less distinguished. The holy bishop attended him at Trier in the year 383, to solicit some favours. Maximus made him sit at his table with the most illustrious persons of his court, and placed him at his right hand. In drinking, the

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usurper commanded his servants to give him a cup, that he might again receive it from him; but this extraordinary prelate gave it to the priest who accompanied him on his journey. This holy boldness, far from displeasing them, gained him the favour of the emperor and of his court. Martin, who was an enemy to heresy, but a friend to mankind, employed his influence with this prince to preserve the Priscillanists, who were prosecuted by Ithace and by Idace, bishops of Spain. The bishop of Tours would hold no communion with men whose principles of religion inclined them to shed the blood of mankind; and he obtained the life of those whose death they had solicited. On his return to Tours, he prepared himself for the reward of his labours in another world. He died at Candes the 8th of November 397, but according to others on the 11th of November 400. His name is given to a particular opinion concerning the mystery of the holy Trinity. St Martin is the first of the saints confessors to whom the Latin church offered public prayers. His life is written in elegant Latin by Fortunatus, and Salpitiu Severus one of his disciples. Paul of Perigueux and Fortunatus of Poitiers have given us Sulpicius's life of Martin in verse; but they have debased the admirable prose of the author by a wretched poetical imitation. Nicolas Gervais wrote also the life of St Martin, full of many curious and entertaining facts, published at Tours in 1699, in 4to. The tradition at Amiens is, that St Martin performed the act of charity which rendered him so famous, near an ancient gate of the city, of which the ruins are still visible. The following Latin verses, which do more honour to the saint than to the poet, are inscribed on one of the stones:

*Hic quondam vestem Martinus demidiavit;
Ut faceremus idem, nobis exemplificavit.*

MARTIN (Benjamin), one of the most eminent artists and mathematicians of the age, was born in 1704. After publishing a variety of ingenious treatises, and particularly a Scientific Magazine under his own name, and carrying on for many years a very extensive trade as an optician and globe-maker in Fleet-street, the growing infirmities of age compelled him to withdraw from the active part of business. Trusting too fatally to what he thought the integrity of others, he unfortunately, though with a capital more than sufficient to pay all his debts, became a bankrupt. The unhappy old man, in a moment of desperation from this unexpected stroke, attempted to destroy himself; and the wound, though not immediately mortal, hastened his death, which happened February 9th 1782, in his 78th year. He had a valuable collection of fossils and curiosities of almost every species; which, after his death, were almost given away by public auction. His principal publications, as far as they have occurred to recollection, are, *The Philosophic Grammar*; being a view of the present state of experimental physiology, or natural philosophy, 1735, 8vo. A new, complete, and universal System or Body of Decimal Arithmetic, 1735, 8vo. The young Students Memorial Book, or Patent Library, 1735, 8vo. Description and Use of both the Globes, the Armillary Sphere and Orrery, Trigonometry, 1736, 2 vols 8vo.

4 F

Memoirs

Martin.

Martin Memoirs of the Academy of Paris, 1740, 5 vols.
|| System of the Newtonian Philosophy, 1759, 3 vols.
Martinico. New Elements of Optics, 1759. Mathematical Institutions, viz. Arithmetic, Algebra, Geometry, and Fluxions, 1759. Natural History of England, with a Map of each County, 1759, 2 vols. Philology, and Philosophical Geography, 1759. Mathematical Institutions, 1764, 2 vols. Lives of Philosophers, their Inventions, &c. 1764. Introduction to the Newtonian Philosophy, 1765. Institutions of Astronomical Calculations, 2 parts, 1765. Description and Use of the Air-pump, 1766. Description of the Torricellian Barometer, 1766. Appendix to the Description and Use of the Globes, 1766. Philosophia Britannica, 1778, 3 vols. Gentleman and Lady's Philosophy, 3 vols. Miscellaneous Correspondence, 4 vols. System of Philology. Philosophical Geography. Magazine complete, 14 vols. Principles of Pump-work. Theory of the Hydrometer. Doctrine of Logarithms.

MARTIN (St.), a small but strong town of France, in the isle of Rhée, with a harbour and a strong citadel, fortified after the manner of Vauban. The island lies near the coast of Poitou. W. Long. 1. 0. N. Lat. 45. 40.

Cape MARTIN, a promontory of Valencia in Spain, near a town called *Denia*, and separates the gulph of Valencia from that of Alicant.

MARTIN (St.), an island of America, and one of the Caribbees, lying on the gulph of Mexico, to the north-west of St Bartholomew, and to the south-west of Anguilla. It is 42 miles in circumference; has neither harbour nor river, but several salt-pits. After various revolutions, it is at length in possession of the French and Dutch, who possess it conjointly. W. Long. 62. 35. N. Lat. 18. 15.

MARTIN, in zoology. See **HIRUNDO** and **MUSTELA**.

Free MARTIN, in zoology, is a name given in this country to a cow-calf cast at the same time with a bull-calf, which is a kind of hermaphrodite that is never known to breed nor to discover the least inclination for the bull, nor does the bull ever take the least notice of it. See **HERMAPHRODITE**.

MARTINGALE, in the manege, a thong of leather, fastened to one end of the girths under a horse's belly, and at the other end to the muffs-roll, to keep him from rearing.

MARTINICO, the chief of the French Caribbee islands, the middle of which is situated in W. Long. 61. 0. N. Lat. 14. 30.

This island was first settled by M. Desnambuc a Frenchman, in the year 1635, with only 100 men from St Christopher's. He chose rather to have it peopled from thence than from Europe; as he foresaw, that men, tired with the fatigue of such a long voyage, would mostly perish soon after their arrival, either from the climate, or from the hardships incident to most emigrations. They completed their first settlement without any difficulty. The natives, intimidated by their fire-arms, or seduced by promises, gave up the western and southern parts of the island to the new comers. In a short time, however, perceiving the number of these enterprising strangers daily increasing,

they resolved to extirpate them, and therefore called **Martinico** in the savages of the neighbouring islands to assist them. They fell jointly upon a little fort, that had been hastily erected; but were repulsed, with the loss of 700 or 800 of their best warriors, who were left dead upon the spot.

After this check, the savages for a long time disappeared entirely; but at last they returned, bringing with them presents to the French, and making excuses for what had happened. They were received in a friendly manner, and the reconciliation sealed with pots of brandy. This peaceable state of affairs, however, was of no long continuance; the French took such undue advantages of their superiority over the savages, that they soon rekindled in the others that hatred which had never been entirely subdued. The savages, whose manner of life requires a vast extent of land, finding themselves daily more and more straitened, had recourse to stratagem, in order to destroy their enemies. They separated into small bands, and way-laid the French as they came singly out into the woods to hunt, and, waiting till the sportsman had discharged his piece, rushed upon and killed him before he could charge it again. Twenty men had been thus assassinated before any reason could be given for their sudden disappearance: but as soon as the matter was known, the French took a severe and fatal revenge; the savages were pursued and massacred, with their wives and children, and the few that escaped were driven out of Martinico, to which they never returned.

The French being thus left sole masters of the island, lived quietly on those spots which best suited their inclinations. At this time they were divided into two classes. The first consisted of those who had paid their passage to the island, and these were called *inhabitants*; and to these the government distributed lands, which became their own, upon paying a yearly tribute. These inhabitants had under their command a multitude of disorderly people brought over from Europe at their expence, whom they called *engagés*, or bondsmen. This engagement was a kind of slavery for the term of three years; on the expiration of which they were at liberty, and became the equals of those whom they had served. They all confined themselves at first to the culture of tobacco and cotton; to which was soon added that of arnotto and indigo. The culture of sugar also was begun about the year 1650. Ten years after, one Benjamin D'Acosta, a Jew, planted some cocoa trees; but his example was not followed till 1684, when chocolate was more commonly used in France. Cocoa then became the principal support of the colonists, who had not a sufficient fund to undertake sugar-plantations; but by the inclemency of the season in 1718, all the cocoa-trees were destroyed at once.—Coffee was then proposed as a proper object of culture. The French ministry had received, as a present from the Dutch, two of these trees, which were carefully preserved in the king's botanical garden. Two young shoots were taken from these, put on board a ship for Martinico, and entrusted to the care of one Mr Desclieux. The ship happened to be straitened for want of fresh water; and the trees would have perished, had not the gentleman shared with

Martinico. with them that quantity of water which was allowed for his own drinking. The culture of coffee was then begun, and attended with the greatest and most rapid success. About the end of last century, however, the colony had made but small advances. In 1700, it had only 6597 white inhabitants. The savages, mulattoes, and free negroes, men, women, and children, amounted to no more than 507. The number of slaves was but 14,566. All these together made a population of 21,645 persons. The whole of the cattle amounted to 3668 horses or mules, and 9217 head of horned cattle. The island produced a great quantity of cocoa, tobacco, and cotton; had nine indigo houses, and 183 small sugar-plantations.

After the peace of Utrecht, Martinico began to emerge from that feeble state in which it had so long continued. The island then became the mart for all the windward French settlements. In the ports of it the neighbouring islands sold their produce, and bought the commodities of the mother-country; and, in short, Martinico became famous all over Europe. In 1736, there were on the island 447 sugar works; 11,953,232 coffee trees, 193,870 of cocoa; 2,068,480 plants of cotton, 39,400 of tobacco, 6750 of annatto. The supplies for provision consisted of 4,806,142 banana trees; 34,483,000 trenches of cassava; and 247 plots of potatoes and yams. The number of blacks amounted to 72,000 men, women, and children. Their labour had improved the plantations as far as was consistent with the consumption then made in Europe of American productions; and the annual exports from the island amounted to about 700,000 l.

The connections of Martinico with the other islands entitled her to the profits of commission, and the charges of transport; as she alone was in the possession of carriages. This profit might be rated at the tenth of the produce; and the sum total must have amounted to near 765,000 l. This standing debt was seldom called in, and left for the improvement of their plantations. It was increased by advances in money, slaves, and other necessary articles; so that Martinico became daily more and more a creditor to the other islands, and thus kept them in constant dependence; while they all enriched themselves by her assistance.

The connections of this island with Cape Breton, Canada, and Louisiana, procured a market for the ordinary sugars, the inferior coffee, the molasses, and rum, which would not sell in France. In exchange the inhabitants received salt-fish, dried vegetables, deals, and some flour. In the clandestine trade on the coasts of Spanish America, consisting wholly of goods manufactured by the nation, she commonly made a profit of 90 per cent. on the value of about 175,000 l. sent yearly to the caraccas, or neighbouring colonies.

So many prosperous engagements brought immense sums into Martinico. Upwards of 787,000 l. were constantly circulated in that island with great rapidity; and this is perhaps the only country in the world, where the specie has been so considerable as to make it a matter of indifference to them whether they dealt in gold, silver, or commodities. This extensive trade brought into the ports of Martinico annually 200 ships from France; 14 or 15 fitted out by the mother-country for the coast of Guinea, 60 from Canada, 10

or 12 from the islands of Margareta and Trinidad; **Martinico.** besides the English and Dutch ships that came to carry on a smuggling trade. The private navigation from the island to the northern colonies, to the Spanish continent, and to the windward islands, employed 120 vessels from 20 to 30 tons burden.

The war of 1744 put a stop to this prosperity. Not that the fault was in Martinico itself; its navy, constantly exercised, and accustomed to frequent engagements, which the carrying on a contraband trade required, was prepared for action. In less than six months, 40 privateers, fitted out at St Peter's, spread themselves about the latitude of the Caribbee islands. They signalised themselves in a manner worthy of the ancient freebooters; returning constantly in triumph, and laden with an immense booty. Yet, in the midst of these successes, an entire stop was put to the navigation of the colony, both to the Spanish coast and to Canada, and they were constantly disturbed even on their own coasts. The few ships that came from France, in order to compensate the hazards they were exposed to by the loss of their commodities, sold them at a very advanced price, and bought them at a very low one. By this means the produce decreased in value, the lands were ill cultivated, the works neglected, and the slaves perishing for want.

When every thing thus seemed tending to decay, the peace at last restored the freedom of trade, and with it the hopes of recovering the ancient prosperity of the island. The event, however, did not answer the pains that were taken to attain it. Two years had not elapsed after the cessation of hostilities, when the colony lost the contraband trade she carried on with the American Spaniards. This was owing to the substitution of register-ships to the fleets; and thus were the attempts of the smugglers confined within very narrow bounds. In the new system, the number of ships was undetermined, and the time of their arrival uncertain: which occasioned a variation in the price of commodities unknown before; and from that time the smuggler, who only engaged in this trade from the certainty of a fixed and constant profit, would no longer pursue it, when it did not secure him an equivalent to the risks he ran. But this loss was not so sensibly felt by the colony, as the hardships brought upon them by the mother-country. An unskilful administration clogged the reciprocal and necessary connection between the Islands and North-America with so many formalities, that in 1755 Martinico sent but four vessels to Canada. The direction of the colonies, now committed to the care of ignorant and avaricious clerks, soon lost its importance, sunk into contempt, and was prostituted to venality. The debts which had been contracted, during a series of calamities, had not yet been paid off, when the war broke out afresh. After a series of misfortunes and defeats, the island fell into the hands of the British. It was restored, however, in July 1763, 16 months after it had been conquered; but deprived of all the necessary means of prosperity, that had made it of so much importance. For some years past, the contraband trade carried on to the Spanish coasts was almost entirely lost. The cession of Canada had precluded all hopes of opening again a communication, which had only been interrupted by temporary mistakes. The productions of

Martinico. the Grenades, St Vincent, and Dominica, which were now become British dominions, could no longer be brought into their harbours; and a new regulation of the mother-country, which forbade her having any intercourse with Gaudalupe, left her no hopes from that quarter.

The colony, thus deprived of every thing as it were, and destitute, nevertheless contained, at the last survey, which was taken on the first of January 1770, in the compass of 28 parishes, 12,450 white people of all ages and of both sexes; 1814 free blacks or mulattoes; 70,553 slaves, and 443 fugitive negroes. The number of births in 1766, was in the proportion of one in 30 among the white people, and of one in 25 among the blacks. From this observation, if it were constant, it should seem that the climate of America is much more favourable to the propagation of the Africans than of the Europeans; since the former multiply still more in the labours and hardships of slavery, than the latter in the midst of plenty and freedom. The consequence must be, that in process of time the increase of blacks in America will surpass that of the white men; and, perhaps, at last avenge this race of victims on the descendants of the oppressors.

The cattle of the colony consists of 8283 horses or mules; 12,376 head of horned cattle; 975 hogs; and 13,544 sheep or goats.

Their provisions are, 17,930,596 trenches of cassava; 3,509,048 banana-trees; and 406 squares and a half of yams and potatoes.

Their plantations contain 11,444 squares of land, planted with sugar; 6,638,957 coffee-trees; 871,043 cocoa-trees; 1,764,807 cotton-plants; 59,966 trees of cassia, and 61 of annatto.

The meadows or savannahs take up 10,072 squares of land; there are 11,966 in wood, and 8448 uncultivated or forsaken.

The plantations which produce coffee, cotton, cocoa, and other things of less importance, are 1515 in number. There are but 286 for sugar. They employ 116 water-mills, 12 wind-mills, and 184 turned by oxen. Before the hurricane of the 13th of August 1766, there were 302 small habitations and 15 sugar-works more.

In 1769, France imported from Martinico, upon 202 trading vessels, 177,116 quintals of fine sugar, and 12,579 quintals of raw sugar; 68,518 quintals of coffee; 11,731 quintals of cocoa; 6048 quintals of cotton; 2518 quintals of cassia; 783 casks of rum; 307 hogsheads of molasses; 150 pounds of indigo; 2147 pounds of preserved fruits; 47 pounds of chocolate; 282 pounds of rasped tobacco; 494 pounds of rope-yarn; 334 chests of liqueurs; 234 hogsheads of molasses, &c. 451 quintals of wood for dyeing; and 12,108 hides in the hair. All these productions together have been bought in the colony itself, for 536,631 l. 9 s. 10 d. It is true, that the colony has received from the mother-country to the amount of 588,412 l. 16 s. 6 d. of merchandise; but part of this has been sent away to the Spanish coasts, and another part has been conveyed to the English settlements.

The island is 16 leagues in length and 45 in circumference, leaving out the capes, some of which extend two or three leagues into the sea. It is very un-

even, and intersected in all parts by a number of hills; which are mostly of a conical form. Three mountains rise above these smaller eminences. The highest bears the indelible marks of a volcano. The woods with which it is covered continually attract the clouds, which occasions noxious damps, and contributes to make it horrid and inaccessible; while the two others are in most parts cultivated. From these mountains issue the many springs that water the island. These waters, which flow in gentle streams, are changed into torrents on the slightest storm. Their qualities are derived from the soil over which they flow. In some places they are excellent, in others so bad, that the inhabitants are obliged to drink the water they have collected during the rainy season.

Of all the French settlements in the West Indies, Martinico is the most happily situated with regard to the winds which prevail in those seas. Its harbours possess the inestimable advantage of affording a certain shelter from the hurricanes which annoy these latitudes. The harbour of Fort Royal is one of the best in all the windward islands; and so celebrated for its safety, that, when it was open to the Dutch, their shipmasters had orders from the republic to take shelter there in June, July, and August, the three months in which the hurricanes are most frequent. The lands of the Lamentin, which are but a league distant, are the richest and most fertile in the whole island. The numerous streams which water this fruitful country, convey loaded canoes to a considerable distance from the sea. The protection of the fortifications secured the peaceable enjoyment of so many advantages; which, however, were balanced by a swampy and unwholesome soil. This capital of Martinico was also the rendezvous of the men of war; which branch of the navy has always oppressed the merchantmen. On this account, Fort Royal was an improper place to become the centre of trade, and was therefore removed to St Peter's. This little town, notwithstanding the fires that have four times reduced it to ashes, still contains 1700 houses. It is situated on the western coast of the island, on a bay, or inlet, which is almost circular. One part of it is built on the strand along the sea side, which is called the anchorage; and is the place destined for ships and ware-houses. The other part of the town stands upon a low hill: it is called the Fort from a small fortification that was built there in 1665, to check the seditions of the inhabitants against the tyranny of monopoly; but it now serves to protect the road from foreign enemies. These two parts of the town are separated by a rivulet.

The anchorage is at the back of a pretty high and steep hill. Shut up as it were by this hill, which intercepts the easterly winds, the most constant and most salubrious in these parts; exposed, without any refreshing breezes, to the scorching beams of the sun, reflected from the hill, from the sea, and the black sand on the beach; this place is extremely hot, and always unwholesome. Besides, there is no harbour; and the ships which cannot winter safely upon this coast are obliged to take shelter at Fort-Royal. But these disadvantages are compensated by the conveniency of the road of St Peter's, for loading and unloading of goods; and by its situation, which is such that ships can freely go in and out at all times, and with all winds.

MARTLETS,

Martlets

||
Martyr.

MARTLETS, in heraldry, little birds represented without feet; and used as a difference or mark of distinction for younger brothers, to put them in mind that they are to trust to the wings of virtue and merit, in order to raise themselves, and not to their feet, they having little land to set their foot on. See HERALDRY, Plate CCXXVII. fig. 1. A.

MARTYNIA, in botany: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 10th order, *Personata*. The calyx is quinquesid, the corolla ringent, the capsule ligneous, covered with a bark, with a hooked beak, trilocular, and bivalved.—There are two species; both of them tender, herbaceous, flowery plants of South America; one of them an annual, the other a perennial, rising with erect stalks, from a foot to two feet high, garnished with oblong simple leaves, and terminated by short spikes of large monopetalous, bell-shaped flowers, of blue and purple colours. They flower in July and August, and are very ornamental, but require always to be kept in the hottest part of the stove.

MARTYR, is one who lays down his life, or suffers death, for the sake of his religion. The word is Greek, *μαρτυρ*, and properly signifies “a witness.” It is applied, by way of eminence, to those who suffer in witness of the truth of the gospel.

The Christian church has abounded in martyrs, and history is filled with surprising accounts of their singular constancy and fortitude under the cruellest torments human nature was capable of suffering. The primitive Christians were accused by their enemies of paying a sort of divine worship to the martyrs. Of this we have an instance in the answer of the church of Smyrna to the suggestion of the Jews, who, at the martyrdom of Polycarp, desired the heathen judge not to suffer the Christians to carry off his body, lest they should leave their crucified master, and worship him in his stead. To which they answered, “We can neither forsake Christ, nor worship any other: for we worship him as the Son of God; but love the martyrs as the disciples and followers of the Lord, for the great affection they have shown to their King and Master.” A like answer was given at the martyrdom of Fructuosus in Spain. For when the judge asked Eulogius, his deacon, Whether he would not worship Fructuosus? as thinking, that, tho’ he refused to worship the heathen idols, he might yet be inclined to worship a Christian martyr; Eulogius replied, “I do not worship Fructuosus, but him whom Fructuosus worships.” The primitive Christians believed, that the martyrs enjoyed very singular privileges; that upon their death they were immediately admitted to the beatific vision, while other souls waited for the completion of their happiness till the day of judgment; and that God would grant chiefly to their prayers the hastening of his kingdom, and shortening the times of persecution.

The churches built over the graves of the martyrs, and called by their names, in order to preserve the memory of their sufferings, were distinguished by the title *martyrium confessio*, or *memoria*.

The festivals of the martyrs are of very ancient date in the Christian church, and may be carried back at least till the time of Polycarp, who suffered martyrdom

about the year of Christ 168. On these days the Christians met at the graves of the martyrs, and offered prayers and thanksgivings to God for the examples they had afforded them: they celebrated the eucharist, and gave alms to the poor; which, together with a panegyric oration or sermon, and reading the acts of the martyrs, were the spiritual exercises of these anniversaries.

Of the sayings, sufferings, and deaths of the martyrs, though preserved with great care for the above purpose, and to serve as models to future ages, we have but very little left, the greatest part of them having been destroyed during that dreadful persecution which Dioclesian carried on for ten years with fresh fury against the Christians; for a most diligent search was then made after all their books and papers; and all of them that were found were committed to the flames. Eusebius, indeed, composed a martyrology, but it never reached down to us; and those since compiled are extremely suspected. From the eighth century downwards, several Greek and Latin writers endeavoured to make up the loss, by compiling, with vast labour, accounts of the lives and actions of the ancient martyrs, but which consist of little else than a series of fables: Nor are those records that pass under the name of Martyrology worthy of superior credit, since they bear the most evident marks both of ignorance and falsehood.

MARTYR (Peter), a famous divine, born at Florence in 1500. He studied philosophy and the tongues at Padua and Banonia, was a regular Augustine in the monastery of Fiscoli, and was counted one of the best preachers in Italy. Zuinglius and Bucer’s writings gave him a good opinion of the Protestants, and his conversation with Valdes confirmed it. He preached that doctrine at Rome in private; but, being impeached, fled to Naples, and thence to Lucca, where he brought over to the Protestant interest Emanuel Tremellius, Celsus, Martinengas, Paul Lasicius, and Jeremiah Zanchy. He was sent for to England by king Edward VI. and made professor of divinity at Oxford in 1549. In Queen Mary’s reign he returned to Strasburg, and was present at the conference of Poissy. His sentiments were not the same with Calvin’s about Christ’s presence in the eucharist. He wrote a great number of works, and died in 1562.

MARTYROLOGY, a catalogue or list of martyrs, including the history of their lives and sufferings for the sake of religion. The term comes from *μαρτυρ* “witness,” and *λεγω dico*, or *λεγω colligo*.

The martyrologies draw their materials from the kalendars of particular churches, in which the several festivals dedicated to them are marked; and which seem to be derived from the practice of the ancient Romans, who inserted the names of heroes and great men in their fasti or public registers.

The martyrologies are very numerous, and contain many ridiculous and even contradictory narratives; which is easily accounted for, if we consider how many forged and spurious accounts of the lives of saints and martyrs appeared in the first ages of the church, which the legendary writers afterwards adopted without examining into the truth of them. However, some good critics, of late years, have gone a great way towards clearing

Martyr,
Martyro-
logy.

Martyro-
logy,
Marvell.

clearing the lives of the saints and martyrs from the monstrous heap of fiction they laboured under. See the article *LEGEND*.

The martyrology of Eusebius of Cæsarea was the most celebrated in the ancient church. It was translated into Latin by St Jerom; but the learned agree that it is not now extant. That attributed to Beda, in the eighth century, is of very doubtful authority; the names of several saints being there found who did not live till after the time of Beda. The ninth century was very fertile in martyrologies; then appeared that of Florus, subdeacon of the church at Lyons; who, however, only filled up the chasms in Beda. This was published about the year 830, and was followed by that of Waldenburtus, monk of the diocese of Treves, written in verse about the year 848, and this by that of Usuard, a French monk, and written by the command of Charles the Bald in 875, which last is the martyrology now ordinarily used in the Romish church. That of Rabanus Maurus is an improvement on Beda and Florus, written about the year 845; that of Notker, monk of St Gal, was written about the year 894. The martyrology of Ado, monk of Ferrieres, in the diocese of Treves, afterwards archbishop of Vienne, is a descendant of the Roman, if we may so call it; for Du Sollier gives its genealogy thus: The martyrology of St Jerom is the great Roman martyrology; from this was made the little Roman one printed by Rosweyd; of this little Roman martyrology was formed that of Beda, augmented by Florus. Ado compiled his in the year 858. The martyrology of Nevelon, monk of Corbie, written about the year 1089, is little more than an abridgment of that of Ado; father Kircher also makes mention of a Coptic martyrology preserved by the Maronites at Rome.

We have also several protestant martyrologies, containing the sufferings of the reformed under the papists, viz. an English martyrology, by J. Fox; with others by Clark, Bray, &c.

MARTYROLOGY is also used, in the Romish church, for a toll or register kept in the vestry of each church, containing the names of all the saints and martyrs, both of the universal church and of the particular ones of that city or monastery.

MARTYROLOGY is also applied to the painted or written catalogues in the Romish churches, containing the foundations, obits, prayers, and masses, to be said each day.

MARVELL (Andrew), an ingenious writer in the 17th century, was bred at Cambridge. He travelled thro' the most polite parts of Europe, and was secretary to the embassy at Constantinople. His first appearance in public business at home was as assistant to Mr John Milton Latin secretary to the protector. A little before the restoration, he was chosen by his native town, Kingston upon Hull, to sit in that parliament, which began at Westminster April 25th 1660; and is recorded as the last member of parliament who received the wages or allowance anciently paid to representatives by their constituents. He seldom spoke in parliament, but he had great influence without doors upon the members of both houses; and prince Rupert had always the greatest regard for his advice. He made himself very obnoxious to the government by his actions and writings; notwithstanding which, king

Charles II. took great delight in his conversation, and tried all means to win him over to his side, but in vain, nothing being ever able to shake his resolution. There were many instances of his firmness in resisting the offers of the court; but he was proof against all temptations. The king having one night entertained him, sent the lord-treasurer Danby the next morning to find out his lodgings; which were then up two pair of stairs in one of the little courts in the Strand. He was busy writing, when the treasurer opened the door abruptly upon him. Surprised at the sight of so unexpected a visitor, Mr Marvell told his Lordship, "That he believed he had mistaken his way." Lord Danby replied, "Not, now I have found Mr Marvell;" telling him he came from his Majesty, to know what he could do to serve him. Coming to a serious explanation, he told the lord-treasurer, that he knew the nature of courts full well; that whoever is distinguished by a prince's favour, is certainly expected to vote in his interest. The Lord Danby told him, that his Majesty had only a just sense of his merits, in regard to which he only desired to know if there was any place at court he could be pleased with. These offers, though urged with the greatest earnestness, had no effect upon him. He told the Lord-treasurer, that he could not accept of them with honour; for he must be either ungrateful to the king in voting against him, or false to his country in giving into the measures of the court. The only favour therefore he had to request of his Majesty was, that he would esteem him as dutiful a subject as any he had, and more in his proper interest by refusing his offers than if he had embraced them. The Lord Danby finding no arguments could prevail, told him, that the king had ordered a thousand pounds for him, which he hoped he would receive till he could think what farther to ask of his Majesty. The last offer was rejected with the same steadfastness of mind as the first; though, as soon as the Lord-treasurer was gone, he was forced to send to a friend to borrow a guinea. He died not without strong suspicions of his being poisoned, in 1678, in the 58th year of his age. In 1688, the town of Kingston upon Hull contributed a sum of money to erect a monument over him in the church of St Giles in the Fields, where he was interred, and an epitaph composed by an able hand; but the ministry of that church forbid both the inscription and monument to be placed there. He wrote many ingenious pieces; as, *The Rehearsal transposed*; *A short historical Essay concerning General Councils, Creeds, and Impositions in matters of religion, &c.*; also *Poems and Letters*.

MARVELL of Peru, in botany. See *MIRABILIS*.

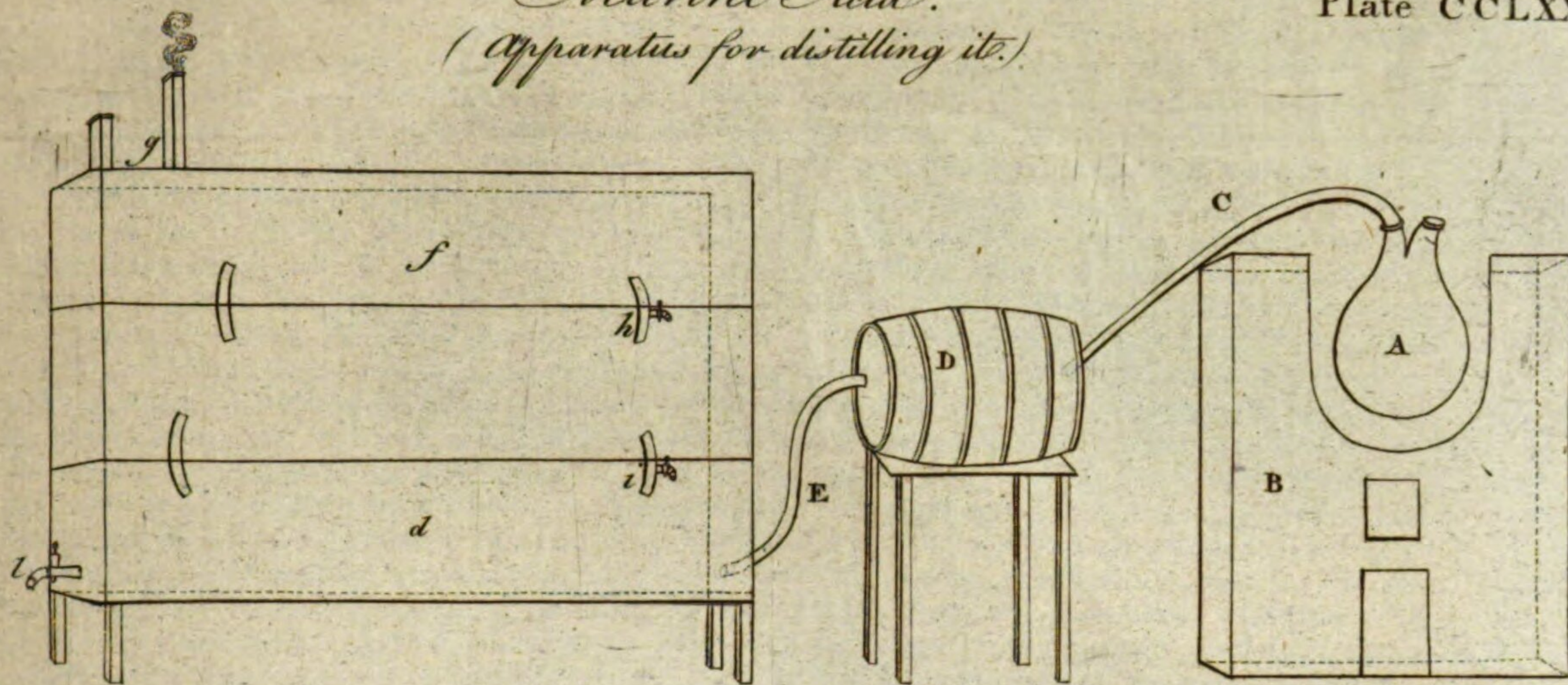
MARY, the mother of our Saviour Jesus Christ, and a virgin at the time that she conceived him; daughter of Joachim and of Anna, of the tribe of Judah, and married to Joseph of the same tribe. The scripture tells us nothing of her parents, not so much as their names, unless Heli mentioned by St Luke iii. 23. be the same with Joachim. All that is said concerning the birth of Mary and of her parents is only to be found in some apocryphal writings; which, however, are very ancient.

Mary was of the royal race of David, as was also her husband; 'A virgin, espoused to a man whose name was Joseph, of the house of David,' says our translation

Marvell,
Mary.

Marine Acid.
(Apparatus for distilling it.)

Plate CCLXXX.



MASONRY.

Fig. 1.

Fig. 2.

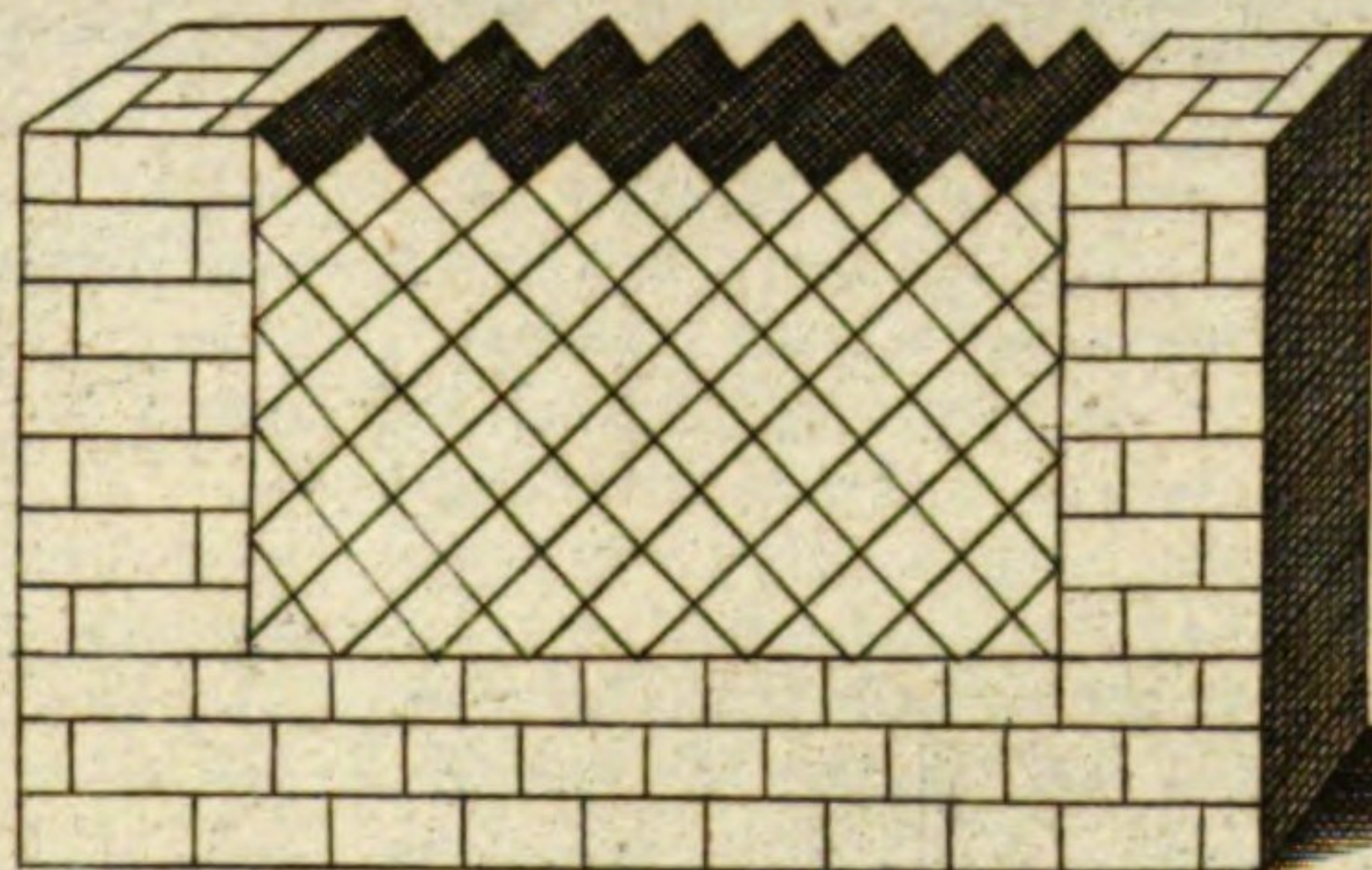
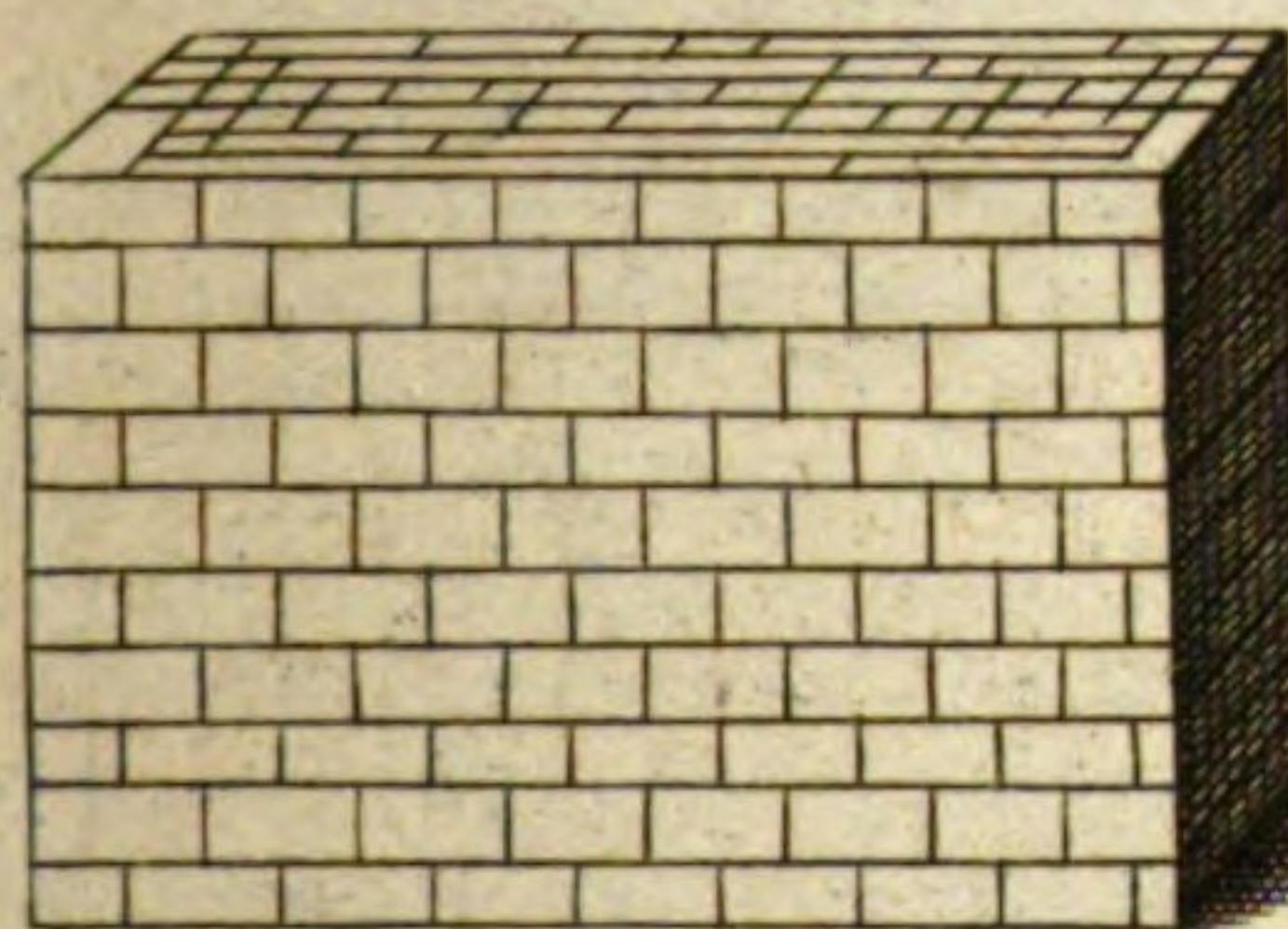


Fig. 3.

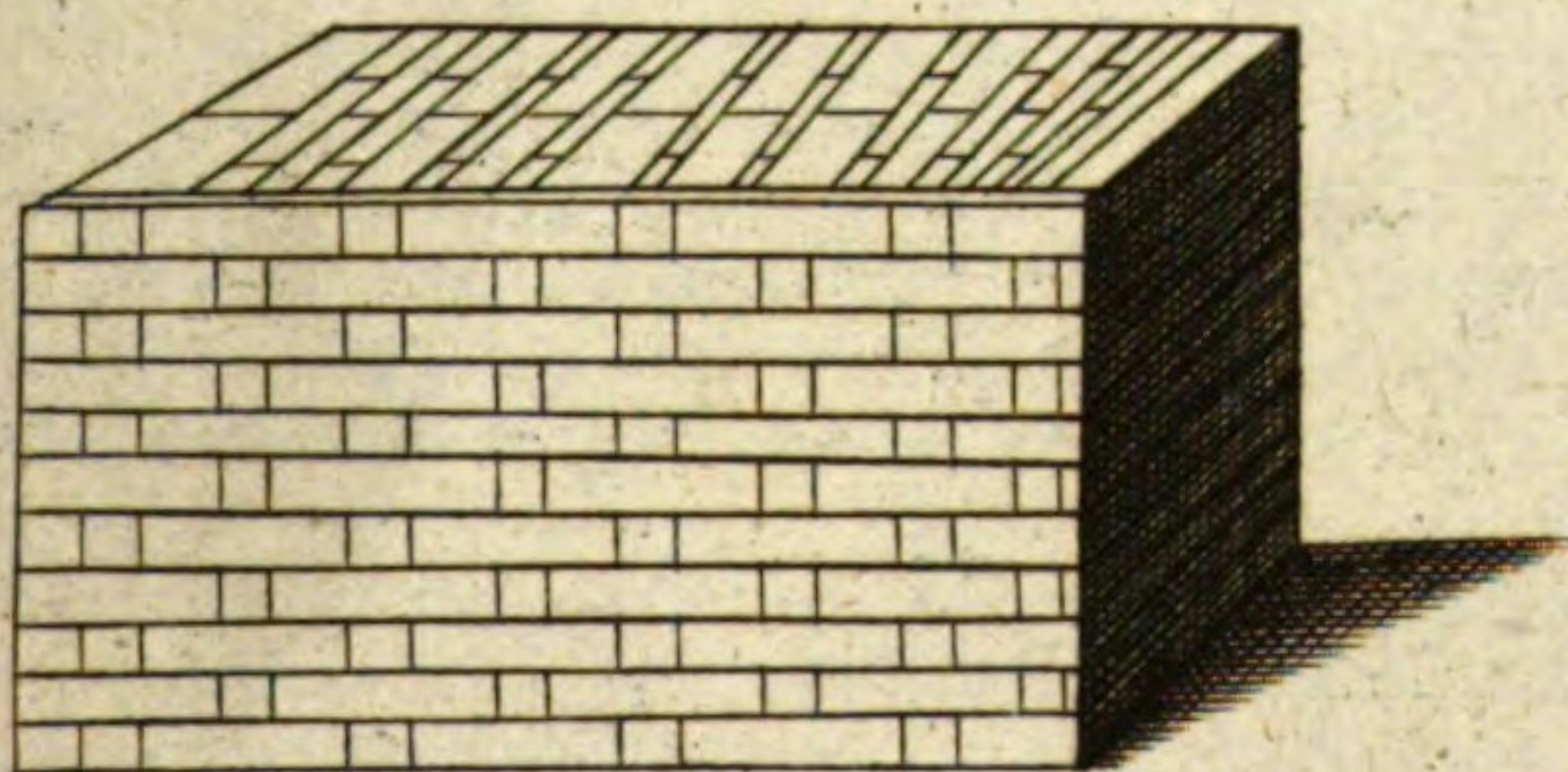


Fig. 4.

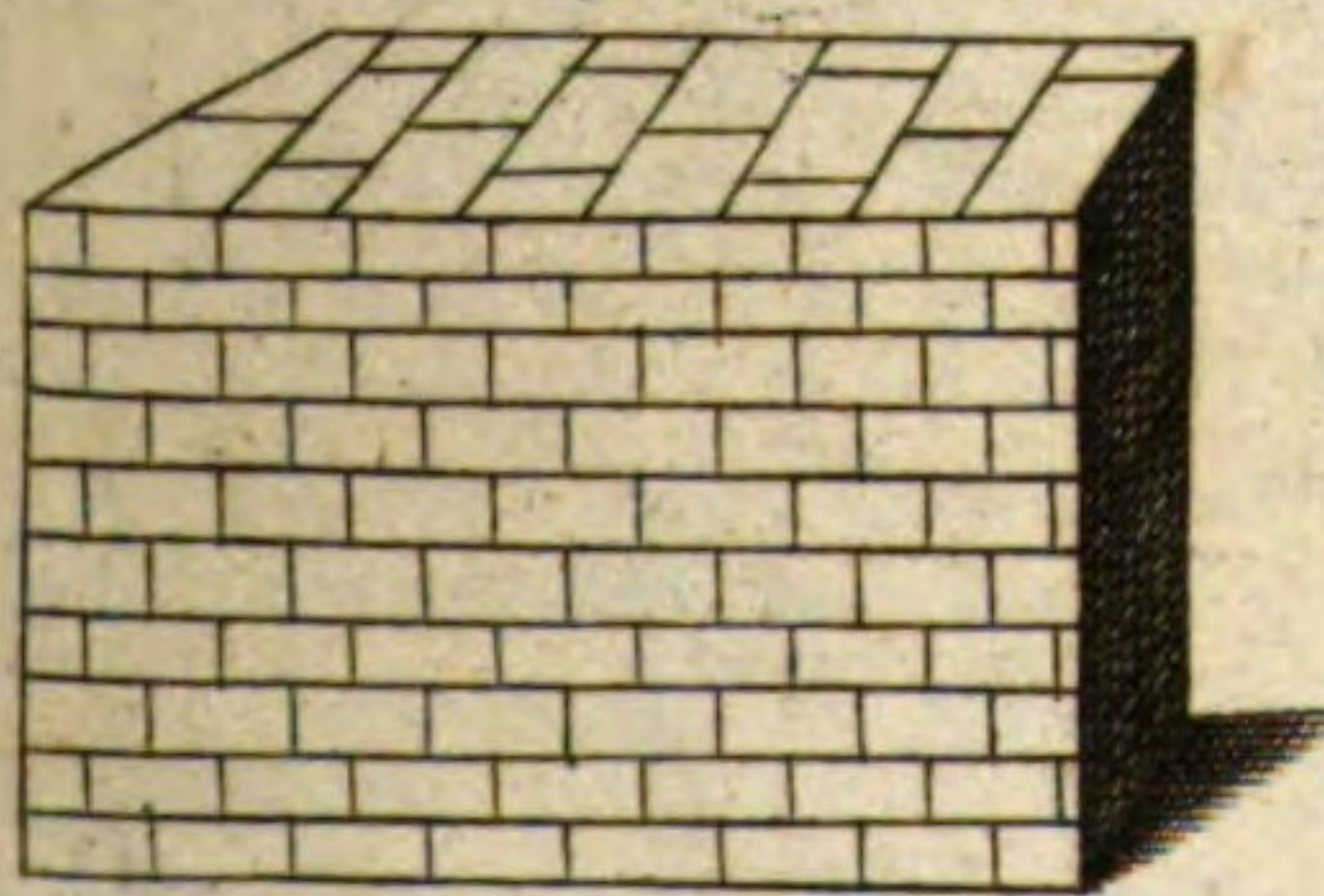


Fig. 6.

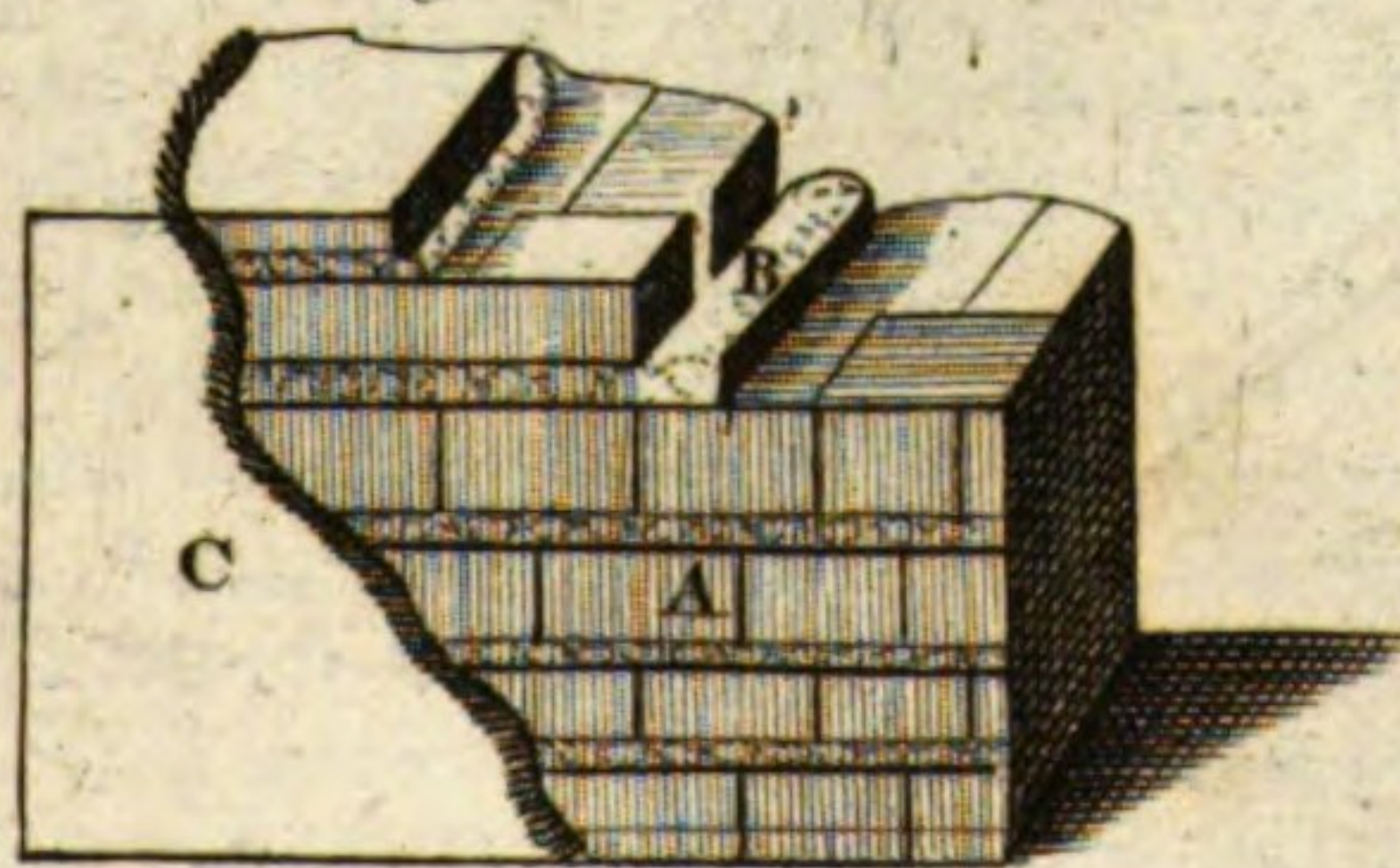


Fig. 5.

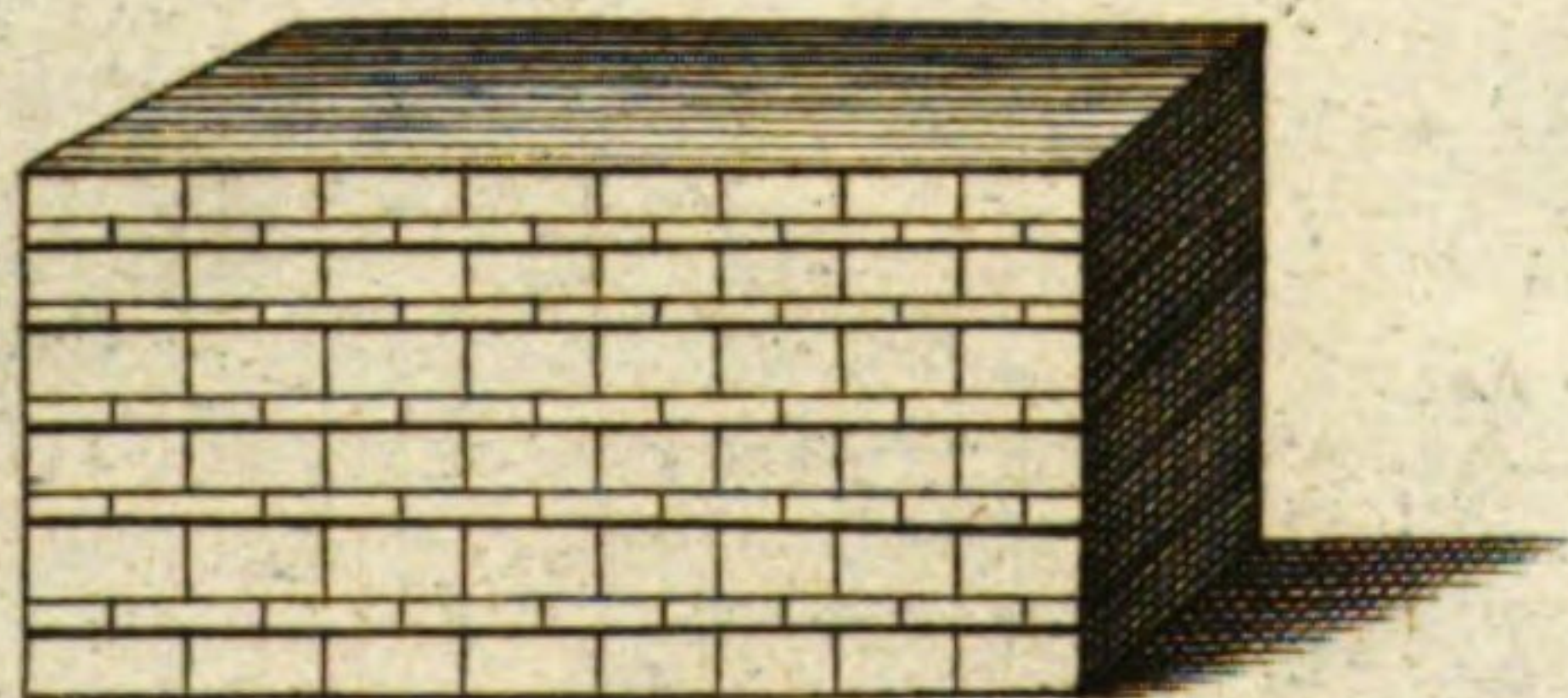


Fig. 7.

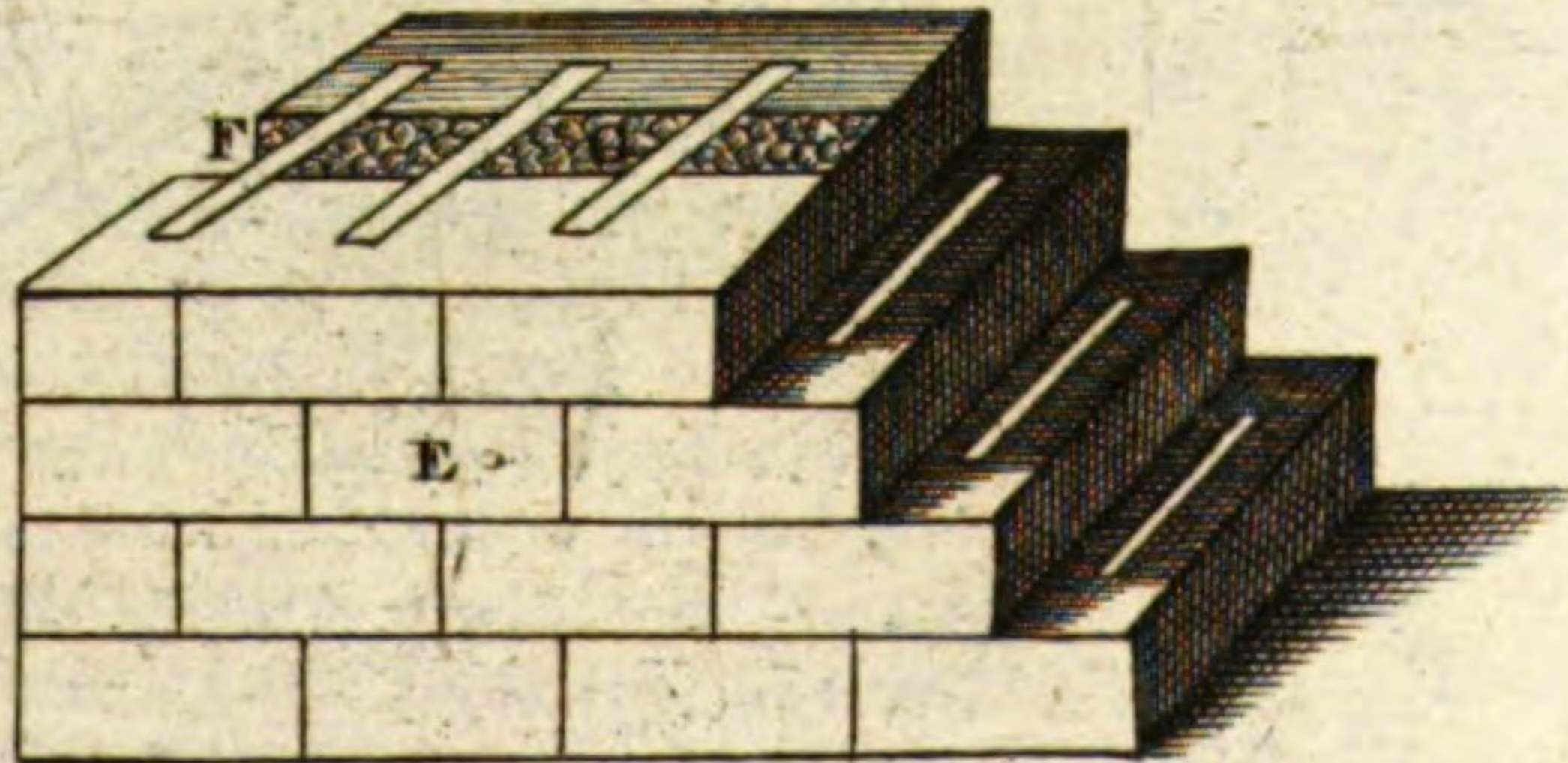


Fig. 8.

A. Bell Prin. M. & Sculptor fecit.

Mary. translation of St Luke i. 27. which translation Mr Whitby thinks might be better rendered thus: 'A virgin of the house of David, espoused to a man whose name was *Joseph*, and the virgin's name was *Mary*;' because this agrees better with the words of the angel, 'The Lord shall give him the throne of his father David,' ver. 32. For since the angel had plainly told the virgin, that she should have this son without the knowledge of any man, it was not Joseph's but Mary's being of the house of David, that made David his father.

Mary was akin to the race of Aaron, since Elizabeth the wife of Zacharias was her cousin (ver. 36). Mary very early made a vow of chastity, and engaged herself to perpetual virginity. The *Proto-evangelium* of St James tells us, that she was consecrated to the Lord, and offered in the temple from her earliest youth; and that the priests gave her Joseph for a spouse, who was an holy and venerable old man, whom providence appointed for this purpose by a miracle, the rod which he commonly carried having grown green and flourished as Aaron's did formerly. He espoused Mary, not to live with her in the ordinary use of marriage, and to have children by her, but only that he might be the guardian of her virginity. Though these circumstances are not to be relied on as certain, yet Mary's resolution of continency, even in a married state, cannot be called in question, since her virginity is attested by the gospel, and that herself speaking to the angel, who declared to her that she should become the mother of a son, told him that 'she knew not a man,' (ver. 34.), or that she lived in continency with her husband: for which reason, when Joseph perceived her pregnancy, he was extremely surprised at it, knowing the mutual resolution they had agreed to of living in continence though in a state of marriage.

When Mary was ready to lie in, an edict was published by Cæsar Augustus, which decreed, that all the subjects of the empire should go to their own cities, there to have their names registered according to their families. Thus Joseph and Mary, who were both of the lineage of David, betook themselves to the city of Bethlehem, from whence was the original of their family. But while they were in this place, the time being fulfilled in which Mary was to be delivered, she brought forth her first-born son. She wrapped him in swaddling-clothes, and laid him in the manger of the stable or cavern whither they had retired: for they could find no place in the public inn, because of the great concourse of people that were then at Bethlehem on the same occasion; or they were forced to withdraw into the stable of the inn, not being able to get a more convenient lodging, because of the multitude of people then at Bethlehem.

At the same time the angels made it known to the shepherds who were in the fields near Bethlehem, and who came in the night to see Mary and Joseph and the child lying in the manger, and to pay him their tribute of adoration. Mary took notice of all these things, and laid them up in her heart, (Luke ii. 19. Matth. ii. 8, 9, 10, 11, &c.). A few days after, the magi or wise men came from the east, and brought to Jesus the mysterious presents of gold, frankincense, and myrrh; after which being warned by an angel that appeared to them in a dream, they returned into their own country by a way different from that

by which they came. But the time of Mary's purification being come, that is 40 days after the birth of Jesus, Mary went to Jerusalem (Luke ii. 21.), there to present her son in the temple, and there to offer the sacrifice appointed by the law for the purification of women after childbirth. There was then at Jerusalem an old man named *Simeon*, who was full of the Holy Ghost, and who had received a secret assurance that he should not die before he had seen Christ the Lord. He came then into the temple by the influence of the spirit of God, and taking the little Jesus within his arms, he blessed the Lord: and afterwards addressing himself to Mary, he told her, 'That this child should be for the rising and falling of many in Israel, and for a sign which should be spoken against; even so far as that her own soul should be pierced as with a sword, that the secret thoughts in the hearts of many might be discovered.' Afterwards when Joseph and Mary were preparing to return to their own country of Nazareth (Matth. ii. 13, 14.), Joseph was warned in a dream to retire into Egypt with Mary and the child, because Herod had a design to destroy Jesus. Joseph obeys the admonition, and they continued in Egypt till after the death of Herod; upon which he and Mary returned to Nazareth, not daring to go to Bethlehem because it was in the jurisdiction of Archelaus the son and successor of Herod the great. Here the holy family took up their residence, and remained till Jesus began his public ministry. We read of Mary being present at the marriage of Cana in Galilee, with her son Jesus and his disciples (John ii. 1, 2, &c.) On which occasion Jesus having turned water into wine, being the first public miracle that he performed, he went from thence to Capernaum with his mother and his brethren, or his parents and disciples: and this seems to be the place where the holy virgin afterwards chiefly resided. However, St Epiphanius thinks that she followed him every where during the whole time of his preaching; though we do not find the evangelists make any mention of her among the holy women that followed him and ministered to his necessities. The virgin Mary was at Jerusalem at the last passover that our Saviour celebrated there; she saw all that was transacted against him, followed him to Calvary, and stood at the foot of his cross with a constancy worthy of the mother of God. There Jesus seeing his mother and his beloved disciple near her, he said to his mother, "Woman, behold thy son;" and to the disciple, "Behold thy mother." And from that hour the disciple took her home to his own house. It is not to be doubted, but that our Saviour appeared to his mother immediately after his resurrection; and that she was the first, or at least one of the first, to whom he vouchsafed this great consolation. She was with the apostles at his ascension, and continued with them at Jerusalem, expecting the coming of the Holy Ghost (Acts i. 14.). After this, she dwelt in the house of St John the Evangelist, who took care of her as of his own mother. It is thought that he took her along with him to Ephesus, where she died in an extreme old age. There is a letter of the œcumenical council of Ephesus, importing, that in the fifth century it was believed she was buried there. Yet this opinion was not so universal, but that there are authors of the same age who think she died and was buried at Jerusalem.

Mary.

Mary.

MARY (Magdalen), who has been generally confounded with Mary the sister of Martha and Lazarus, but very improperly, was probably that sinner mentioned by St Luke, chap. vii. 36, 37, &c. whose name he does not tell us. There are some circumstances sufficient to convince us, that she is the same whom he calls *Mary Magdalen* in chap. viii. 2. and from whom he says Jesus drove out seven devils. Jesus having healed the widow's son of Nain, entered into the city, and there was invited to eat by a pharisee named *Simon*. While he was at table, a woman of a scandalous life came into the house, having an alabaster box full of perfumed oil; and standing upright behind Jesus, and at his feet, for he was lying at table on a couch after the manner of the ancients, she poured her perfume on his feet, kissed them, watered them with her tears, and wiped them with her hair. The Pharisee observing this, said within himself, If this man were a prophet, he would know who this woman is that touches him, that she is one of a wicked life. Then Jesus, who knew the bottom of his heart, illustrated her case by a parable; and concluded with answering the woman, that her sins were forgiven her. In the following chapter, St Luke tells us, that Jesus, in company with his apostles, preached the gospel from city to city; and that there were several women whom he had delivered from evil spirits, and had cured of their infirmities, among whom was Mary called *Magdalen*, out of whom went seven devils. This, it must be owned, is no positive proof that the sinner mentioned before was Mary Magdalen; however, it is all we have in support of this opinion: An opinion which has been ably controverted by others. Mary Magdalen had her surname, it is thought, from the town of Magdalia in Galilee. Lightfoot believes that this Mary is the same with Mary the sister of Lazarus. Magdalen is mentioned by the evangelists among the women that followed our Saviour, to minister to him according to the custom of the Jews. St Luke viii. 2. and St Mark xvi. 9. observe, that this woman had been delivered by Jesus Christ from seven devils. This some understand in the literal sense; but others take it figuratively, for the crimes and wickedness of her past life (supposing her to be the sinner first above mentioned), from which Christ had rescued her. Others maintain, that she had always lived in virginity; and consequently they make her a different person from the sinner mentioned by St Luke: and by the seven devils of which she was possessed, they understand no other than a real possession, which is not inconsistent with a holy life. This indeed is the most probable opinion, and that which has been best supported. In particular, the author of a "Letter to Jonas Hanway" on the subject of Magdalen House, published in 1758, has shown by a variety of learned remarks, and quotations both from the scriptures and from the best commentators, that Mary Magdalen was not the sinner spoken of by Luke, but on the contrary that she "was a woman of distinction, and very easy in her worldly circumstances. For a while, she had laboured under some bodily indisposition, which our Lord miraculously healed, and for which benefit she was ever after very thankful. So far as we know, her conduct was always regular and free from censure; and we may reasonably believe, that

N^o 195.

after her acquaintance with our Saviour it was edifying and exemplary. I conceive of her (continues our author) as a woman of a fine understanding, and known virtue and discretion, with a dignity of behaviour becoming her age, her wisdom, and her high station: by all which, she was a credit to him whom she followed as her master and benefactor. She showed our Lord great respect in his life, at his death, and after it; and she was one of those to whom he first showed himself after his resurrection."

Mary Magdalen followed Christ in the last journey that he made from Galilee to Jerusalem, and was at the foot of the cross with the holy virgin (John xix. 25. Mark xv. 47.). After which she returned to Jerusalem to buy and prepare the perfumes, that she might embalm him after the sabbath was over which was then about to begin. All the sabbath day she remained in the city; and the next day early in the morning she went to the sepulchre, along with Mary the mother of James and Salome (Mark xvi. 1, 2. Luke xxiv. 1, 2.). On the way, they inquired of one another, who should take away the stone from the mouth of the sepulchre, and were sensible of a great earthquake. This was the token of our Saviour's resurrection. Being come to his tomb, they saw two angels, who informed them that Jesus was risen. Upon this Mary Magdalen runs immediately to Jerusalem, and acquaints the apostles with this good news, returning herself to the sepulchre. Peter and John came also, and were witnesses that the body was no longer there. They returned; but Mary stayed, and stooping forward to examine the inside of the tomb, she there saw two angels sitting, one at the head and the other at the foot of the tomb; and immediately afterwards, upon turning about, she beheld the Lord himself. She would have cast herself at his feet to kiss them. But Jesus said to her, "Touch me not, for I am not yet ascended to my Father." As if he had said, "You shall have leisure to see me hereafter; go now to my brethren, my apostles, and tell them, I am going to ascend to my God and to their God, to my Father and to their Father." Thus had Mary the happiness of first seeing our Saviour after his resurrection. (See Math. xxviii. 5, &c. Mark xvi. 6, &c. John xx. 11, 17.)

She returned then to Jerusalem, and told the apostles that she had seen the Lord, that she had spoken to him, and told them what he had said to her. But at first they did not believe her, till her report was confirmed by many other testimonies.—This is what the gospel informs us concerning Mary Magdalen, different from Mary the sister of Martha, though she has been often called by this name. For as to the pretended History of Mary Magdalen, which is said to have been written in Hebrew by Marcella servant of Martha; this can only relate to Mary sister of Martha, and besides is a mere piece of imposture.

MARY, queen and tyrant of England, was eldest daughter of Henry VIII. by his first wife Catharine of Spain, and born at Greenwich in February 1517. Her mother was very careful of her education, and provided her with tutors to teach her what was fitting. Her first preceptor was the famous Linacre, who drew up for her use *The Rudiments of Grammar*, and afterwards *De emendata structura Latini sermonis*.

2

Mary.

Mary. *monis libri sex.* Linacer dying when she was but six years old, Ludovicus Vives, a very learned man of Valenza in Spain, was her next tutor; and he composed for her *De ratione studii puerilis*. Under the direction of these excellent men, she became so great a mistress of Latin, that Erasmus commends her for her epistles in that language. Towards the end of her father's reign, at the earnest solicitation of Queen Catharine Parr, she undertook to translate Erasmus's Paraphrase on the gospel of St John; but being cast into sickness, as Udall relates, partly by overmuch study in this work, after she had made some progress therein, she left the rest to be done by Dr Mallet her chaplain. This translation is printed in the first volume of Erasmus's Paraphrase upon the New Testament, London, 1548, folio; and before it is a Preface, written by Udall, the famous master of Eton school, and addressed to the queen dowager (A).—Had she been educated in Spain, however, and an inquisitor had been her preceptor, she could not have imbibed more strongly the bloody principles of Romish persecution; and to the eternal disgrace of the English prelacy, though the reformation had taken root in both universities, she found English bishops ready to carry her cruel designs to subvert it, into effectual execution. King Edward her brother dying the 6th of July 1553, she was proclaimed queen the same month, and crowned in October by Stephen Gardiner bishop of Winchester. Upon her accession to the throne, she declared, in her speech to the council, that she would not persecute her Protestant subjects: but in the following month, she prohibited preaching without a special licence; and before the expiration of three months, the Protestant bishops were excluded the house of lords, and all the statutes

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of Edward VI. respecting the Protestant religion were repealed. In July 1554, she was married to Philip prince of Spain, eldest son of the emperor Charles V.; and now began that persecution against the Protestants for which her reign is so justly infamous. Some have supposed, that the queen was herself of a compassionate and humane disposition; and that most of those barbarities were transacted by her bishops without her knowledge or privity. Without her knowledge and privity they could not be: it would be a better defence of her to say, that a strict adherence to a false religion, and a conscientious observance of its pernicious and cruel dictates, over-ruled and got the better of that goodness of temper which was natural to her. But neither can this plea be reasonably admitted by any one, who considers her unkind and inhuman treatment of her sister the Lady Elizabeth; her admitting a council for the taking up and burning of her father's body; her most ungrateful and perfidious breach of promise with the Suffolk men; her ungenerous and barbarous treatment of judge Hales, who had strenuously defended her right of succession to the crown; and of Archbishop Cranmer, who in reality had saved her life. Shall we excuse all this by saying, *Tantum religio potuit suadere malorum*? Her obligations to Cranmer deserve to be more particularly set forth. Burnet says, "that her firm adherence to her mother's cause and interest, and her backwardness in submitting to the king her father, were thought crimes of such a nature by his majesty, that he came to a resolution to put her openly to death; and that when all others were unwilling to run any risk in saving her, Cranmer alone ventured upon it. In his gentle way he told the king, "that she was young and indiscreet, and therefore it was no wonder if she obstinately adhered

Mary.

4 G

to

(A) As this preface contains many reflections which may very much edify the females of this age, we shall for their sakes here transcribe a part of it. Mr Udall takes occasion in it to observe to her majesty, "The great number of noble women at that time in England, not only given to the study of human sciences and strange tongues, but also so thoroughly expert in the Holy Scriptures, that they were able to compare with the best writers, as well in enditing and penning of godly and fruitful treatises, to the instruction and edifying of realms in the knowledge of God, as also in translating good books out of Latin or Greek into English, for the use and commodity of such as are rude and ignorant of the said tongues. It was now (he said) no news in England to see young damsels in noble houses, and in the courts of princes, instead of cards and other instruments of idle trifling, to have continually in their hands either psalms, homilies, and other devout meditations, or else Paul's epistles, or some book of holy scripture matters, and as familiarly both to read or reason thereof in Greek, Latin, French, or Italian, as in English. It was now a common thing to see young virgins so trained in the study of good letters, that they willingly set all other vain pastimes at nought for learning's sake. It was now no news at all to see queens and ladies of most high estate and progeny, instead of courtly dalliance, to embrace virtuous exercises of reading and writing, and with most earnest study, both early and late, to apply themselves to the acquiring of knowledge, as well in all other liberal arts and disciplines, as also most especially of God and his holy word. And in this behalf (says he), like as to your highness, as well for composing and setting forth many godly psalms, and divers other contemplative meditations, as also for causing these paraphrases to be translated into our vulgar tongue, England can never be able to render thanks sufficient; so may it never be able, as her deserts require, enough to praise and magnify the most noble, the most virtuous, the most witty, and the most studious lady Mary's grace, for taking such pain and travail in translating this Paraphrase of Erasmus upon the gospel of St John.—What could be a more plain declaration of her most constant purpose to promote God's word, and the free grace of his gospel?" &c. Mr Udall was mistaken; she never meant any such thing: for soon after her accession to the throne, a proclamation was issued for calling in and suppressing this very book, and all others that had the least tendency towards furthering the reformation. And Mr Walpole is of opinion, that the sickness which came upon her while she was translating St John, was all affected; "for (says he) she would not so easily have been cast into sickness, had she been employed on the Legends of St Teresa or St Catharine of Sienna."

Mary.

to that which her mother and all about her had been infusing into her for many years; but that it would appear strange, if he should for this cause so far forget the father, as to proceed to extremities with his own child; that if she were separated from her mother and her people, in a little time there might be ground gained on her; but that to take away her life, would raise horror through all Europe against him:" by which means he preserved her.—Along with Archbishop Cranmer, who had thus saved her life, the bishops Ridley and Latimer were also condemned for heresy at Oxford, and afterwards burnt. In 1556, the persecution became general; and Protestants of all ranks and ages, and of both sexes, fell victims to papal fury. It is observable, likewise, that the same perfidious violation of promises and treaties prevailed in the queen's council, with respect to public affairs. By the treaty of marriage concluded between the queen and Philip, it was expressly stipulated that England should not be engaged in any wars with France on account of Spain; yet in 1557, Philip, who had brought immense sums of money into England, procured an offensive and defensive alliance against France, from the English administration, and 8000 of the queen's choicest troops were sent over to the assistance of the Spaniards in the Low Countries: the loss of Calais to the French was the first fruit of this war; and some assert, that upon this single occasion the queen showed a strong attachment to her native country, lamenting this stroke so deeply, that it occasioned her death; but it is better authenticated, that she was carried off by an epidemic fever, which raged so violently that it did not leave a sufficient number of men in health to get in the harvest. She had long, however, been a prey, if not to remorse, yet to disappointment and chagrin, arising from various cross accidents, such as want of children, and the absence and unkindness of Philip consequent thereupon. Her death happened Nov. 7. 1558, in the 43d year of her age, after a reign of five years, four months, and eleven days. There are some things of her writing still extant. Strype has preserved three prayers or meditations of hers; the first, "Against the assaults of vice;" the second, "A meditation touching adversity;" the third, "A prayer to be read at the hour of death." In Fox's "Acts and monuments" are printed eight of her letters to king Edward and the lords of the council, on her nonconformity, and on the imprisonment of her chaplain Dr Mallet. In the *Sylloge epistolarum* are several more of her letters, extremely curious: one of her delicacy in never having written but to three men; one of affection for her sister; one after the death of Anne Boleyn; and one very remarkable of Cromwell to her. In "Haynes's State Papers," are two in Spanish, to the emperor Char. V.—There is also a French letter, printed by Strype from the Cotton library, in answer to a haughty mandate from Philip, when he had a mind to marry the lady Elizabeth to the duke of Savoy, against the queen's and princess's inclination: it is written in a most abject manner, and a wretched style.

MARY of Medicis, wife of Henry IV. king of France, was declared sole regent of the kingdom in 1610, during the consternation which the assassination of that beloved king had occasioned. By her ambitious in-

trigues, the nation lost all its influence abroad, and was torn to pieces at home by contending factions. After several vicissitudes of fortune, she was abandoned by her son Louis XIII. whose reign had been constantly disturbed by the civil commotions she had occasioned; and died in indigence at Brussels, in 1642, aged 68. She built the superb palace of Luxembourg at Paris, and embellished that city with aqueducts and other ornaments.

MARY queen of Scotland, daughter of James V. was born in the royal palace of Linlithgow on the 8th of December 1542. Her mother was Mary, the eldest daughter of Claude duke of Guise, and widow of Louis duke of Longueville. Her father dying a few days after her birth, she scarcely existed before she was hailed queen.

The government of a queen was unknown in Scotland; and the government of an infant queen could not command much respect from martial and turbulent nobles, who exercised a kind of sovereignty over their own vassals; who looked upon the most warlike of their monarchs in hardly any other light than as the chief of the aristocracy; and who, upon the slightest disquiets, were ever ready to fly into rebellion, and to carry their arms to the foot of the throne.—James had not even provided against the disorders of a minority, by committing to proper persons the care of his daughter's education, and the administration of affairs in her name. The former of these objects, however, was not neglected, though the regency of the kingdom was entrusted to very feeble hands. At six years of age Mary was conveyed to France, where she received her education in the court of Henry II. The opening powers of her mind, and her natural dispositions, afforded early hopes of capacity and merit. After being taught to work with her needle and in tapestry, she was instructed in the Latin tongue; and she is said to have understood it with an accuracy, which is in this age very uncommon in persons of her sex and elevated rank, but which was not then surprising, when it was the fashion among great ladies to study the ancient languages. In the French, the Italian, and the Spanish tongues, her proficiency was still greater, and she spoke them with equal ease and propriety. She walked, danced, and rode with enchanting gracefulness; and she was qualified by nature, as well as by art, to attain to distinction in painting, poetry, and music. To accomplish the woman was not, however, the sole object of her education. Either she was taught, or she very early discovered, the necessity of acquiring such branches of knowledge as might enable her to discharge with dignity and prudence the duties of a sovereign; and much of her time was devoted to the study of history, in which she delighted to the end of her life.

Whilst Mary resided in the court of Henry II. her personal charms made a deep impression on the mind of the Dauphin. It was in vain that the constable Montmorency opposed their marriage with all his influence. The importance of her kingdom to France, and the power of her uncles the princes of Lorraine, were more than sufficient to counteract his intrigues; and the Dauphin obtained the most beautiful princess in Christendom.

Though this alliance placed the queen of Scotland

Mary.

Mary. in the most conspicuous point of view, in the politest court of Europe, and drew to her those attentions which are in the highest degree pleasing to a female mind in the gaiety of youth; it may yet be considered as having accidentally laid the foundation of the greatest part of her future misfortunes. Elizabeth, who now swayed the sceptre of England, had been declared illegitimate by an act of parliament: and though the English Protestants paid no regard to a declaration which was compelled by the tyrannic violence of Henry VIII. and which he himself had indeed rendered null by calling his daughter to the throne after her brother and elder sister; yet the papists both at home and abroad had objections to the legitimacy of Elizabeth's birth, founded on principles which with them had greater weight than the acts of any human legislature. Mary was unquestionably the next heir in regular succession to the English throne, if Elizabeth should die without legitimate issue; and upon her marriage to the Dauphin, she was induced by the persuasion of her uncles, by the authority of the French king, and no doubt partly by her own ambition, to assume the title and arms of queen of England and Ireland. These, indeed, she forebore as soon as she became her own mistress; but the having at all assumed them was an offence which Elizabeth could never forgive, and which rankling in her bosom made her many years afterwards pursue the unhappy queen of Scots to the block.

Henry II. dying soon after the marriage of the Dauphin and Mary, they mounted the throne of France. In that elevated station, the queen did not fail to distinguish herself. The weakness of her husband served to exhibit her accomplishments to the greatest advantage; and in a court where gallantry to the sex, and the most profound respect for the person of the sovereign, were inseparable from the manners of a gentleman, she learned the first lessons of royalty. But this scene of successful grandeur and unmixed felicity was of short duration. Her husband Francis died unexpectedly, after a short reign of sixteen months. Regret for his death, her own humiliation, the disgrace of her uncles the princes of Lorraine, which instantly followed, and the coldness of Catharine of Medicis the queen mother, who governed her son Charles IX. plunged Mary into inexpressible sorrow. She was invited to return to her own kingdom, and she tried to reconcile herself to her fate.

She was now to pass from a situation of elegance and splendour to the very reign of incivility and turbulence, where most of her accomplishments would be utterly lost. Among the Scots of that period, elegance of taste was little known. The generality of them were sunk in ignorance and barbarism; and what they termed religion, dictated to all a petulant rudeness of speech and conduct, to which the queen of France was wholly unaccustomed. During her minority and absence, the Protestant religion had gained a kind of establishment in Scotland; obtained, indeed, by violence, and therefore liable to be overturned by an act of the sovereign and the three estates in parliament. The queen, too, was unhappily of a different opinion from the great body of her subjects, upon that one topic, which among them actuated almost every heart, and directed almost every tongue. She had been educated

in the church of Rome, and was strongly attached to that superstition: Yet she had either moderation enough in her spirit, or discretion enough in her understanding, not to attempt any innovation in the prevailing faith of protestantism. She allowed her subjects the full and free exercise of their new religion, and only challenged the same indulgence for her own. She contrived to attach to her, whether from his heart or only in appearance, her natural brother, the prior of St Andrew's; a man of strong and vigorous parts, who, though he had taken the usual oath of obedience to the Pope, had thrown off his spiritual allegiance, and placed himself at the head of the reformers. By his means she crushed an early and formidable rebellion; and in reward for his services conferred upon him a large estate, and created him Earl of Murray. For two or three years her reign was prosperous, and her administration applauded by all her subjects, except the Protestant preachers; and had she either remained unmarried, or bestowed her affections upon a more worthy object, it is probable that her name would have descended to posterity among those of the most fortunate and the most deserving of Scottish monarchs.

But a queen, young, beautiful, and accomplished, an ancient and hereditary kingdom, and the expectation of a mightier inheritance, were objects to excite the love and ambition of the most illustrious personages. Mary, however, who kept her eye steadily fixed on the English succession, rejected every offer of a foreign alliance; and, swayed at first by prudential motives, and afterwards by love the most excessive, she gave her hand to Henry Stuart, lord Darnley, the son of the earl of Lenox. This nobleman was, after herself, the nearest heir to the crown of England; he was likewise the first in succession after the earl of Arran to the crown of Scotland; and it is known that James V. had intended to introduce into his kingdom the Salique law, and to settle the crown upon Lenox in preference to his own daughter. These considerations made Mary solicitous for an interview with Darnley; and at that interview love stole into her heart, and effaced every favourable thought of all her other suitors. Nature had indeed been lavish to him of her kindness. He was tall of stature; his countenance and shapes were beautiful and regular; and, amidst the masks and dancing with which his arrival was celebrated, he shone with uncommon lustre. But the bounty of nature extended not to his mind. His understanding was narrow; his ambition excessive; his obstinacy inflexible; and under the guidance of no fixed principle, he was inconstant and capricious. He knew neither how to enjoy his prosperity nor how to ensure it.

On the 29th of July 1565, this ill-fated pair were married; and though the queen gave her husband every possible evidence of the most extravagant love; though she infringed the principles of the constitution to confer upon him the title of king; and though she was willing to share with him all the offices, honours, and dignities of royalty—he was not satisfied with his lot, but soon began to clamour for more power. He had not been married seven months, when he entered into a conspiracy to deprive Mary of the government, and to seat himself on her throne. With this view he

Mary. headed a band of factious nobles, who entered her chamber at night; and though she was then far advanced in her pregnancy, murdered her secretary in her presence, whilst one of the ruffians held a cocked pistol to her breast. Such an outrage, together with his infidelity and frequent amours, could not fail to alienate the affections of a high spirited woman, and to open her eyes to those defects in his character which the ardors of love had hitherto prevented her from seeing. She sighed and wept over the precipitation of her marriage: but though it was no longer possible to love him, she still treated him with attention and respect, and laboured to fashion him to the humour of her people.

This was labour in vain. His preposterous vanity and aspiring pride roused the resentment and the scorn of the nobles: his follies and want of dignity made him little with the people. He deserted the conspirators with whom he had been leagued in the assassination of the secretary; and he had the extreme imprudence to threaten publicly the earl of Murray, who, from his talents and his followers, possessed the greatest power of any man in the kingdom. The consequence was, that a combination was formed for the king's destruction; and, on the 10th day of February 1567, the house in which he then resided was early in the morning blown up with gun-powder, and his dead and naked body, without any marks of violence, was found in an adjoining field.

Such a daring and atrocious murder filled every mind with horror and astonishment. The queen, who had been in some measure reconciled to her husband, was overwhelmed with grief, and took every method in her power to discover the regicides; but for some days nothing appeared which could lead to the discovery. Papers indeed were posted on the most conspicuous places in Edinburgh, accusing the earl of Bothwell of the crime; and rumours were industriously circulated that his horrid enterprise was encouraged by the queen. Conscious, it is to be presumed, of her own innocence, Mary was the less disposed to believe the guilt of Bothwell, who was accused as having only acted as her instrument; but when he was charged with the murder by the earl of Lenox, she instantly ordered him on his trial. Through the management of the earl of Morton and others, who were afterwards discovered to have been partners in his guilt, Bothwell was acquitted of all share and knowledge of the king's murder; and what is absolutely astonishing, and shows the total want of honour at that time in Scotland, this flagitious man procured, by means of the same treacherous friends, a paper signed by the majority of the nobles, recommending him as a fit husband for the queen!

Armed with this instrument of mischief, which he weakly thought sufficient to defend him from danger, Bothwell soon afterwards seized the person of his sovereign, and carried her a prisoner to his castle at Dunbar. It has indeed been alleged by the enemies of the queen, that no force was employed on the occa-

sion; that she was seized with her own consent; and that she was even privy to the subscribing of the bond by the nobles. But it has been well observed by one of her ablest vindicators (A), that "her previous knowledge of the bond, and her acquiescence in the seizure of her person, are two facts in apparent opposition to each other. Had the queen acted in concert with Bothwell in obtaining the bond from the nobles, nothing remained but, under the sanction of their unanimous address, to have proceeded directly to the marriage. Instead of which, can we suppose her so weak as to reject that address, and rather *choose* that Bothwell should attempt to seize and carry her off by violence?—an attempt which many accidents might frustrate, and which at all events could not fail to render him or both of them odious to the whole nation. Common sense, then, as well as candour, must induce us to believe, that the scheme of seizing the queen was solely the contrivance of Bothwell and his associates, and that it was really by force that she was carried to Dunbar." Being there kept a close prisoner for 12 days; having, as there is reason to believe, actually suffered the indignity of a rape; perceiving no appearance of a rescue; and being shown the infamous bond of the nobles; Mary promised to receive her ravisher for a husband, as in her opinion the only refuge for her injured honour. Without condemning with asperity this compliance of the queen, it is impossible not to recollect the more dignified conduct which Richardson attributes in similar circumstances to his *Clarissa*; and every man who feels for the sufferings, and respects the memory of Mary, must regret that she had not fortitude to resist every attempt to force upon her as a husband the profligate and audacious villain who had offered her such an insult as no virtuous woman ought ever to forgive. This, however, is only to regret that she was not more than human; that she who possessed so many perfections, should have had them blended with one defect. "In the irretrievable situation of her affairs, let the most severe of her sex say what course was left for her to follow? Her first and most urgent concern was to regain her liberty. That probably she attained by promising to be directed by the advice of her council, where Bothwell had nothing to fear." The marriage, thus inauspiciously contracted, was solemnized on the 15th of May 1567; and it was the signal for revolt to Morton, Lethington, and many of the other nobles, by whose wicked and relentless policy it had been chiefly brought about, and who had bound themselves to employ their swords against all persons who should presume to disturb so desirable an event.

As Bothwell was justly and universally detested, and as the rebels pretended that it was only against him and not against their sovereign that they had taken up arms, troops flocked to them from every quarter. The progress and issue of this rebellion will be seen in our history of SCOTLAND: suffice it to say here, that upon the faith of promises the most solemn, not only of personal safety to herself, but of receiving

Mary.

(A) *Tytler's Dissertation on the Marriage of Queen Mary with the Earl of Bothwell: Transactions of the Society of Antiquaries of Scotland, Vol. I.*

Mary. as much honour, service, and obedience, as ever in any former period was paid by the nobility to the princes her predecessors, the unhappy queen delivered herself into the hands of her rebels, and persuaded her husband to fly from the danger which in her apprehension threatened his life. These promises were instantly violated. The faithless nobles, after insulting their sovereign in the cruellest manner, hurried her as a prisoner to a castle within a lake, where she was committed to the care of that very woman who was the mother of her bastard brother; who, with the natural insolence of a whore's meanness, says Mr Whitaker, asserted the legitimacy of her own child and the illegitimacy of Mary; and who actually carried the natural vulgarity of a whore's impudence so far, as to strip her of all her royal ornaments, and to dress her like a mere child of fortune in a coarse brown cassock.

In this distress the queen's fortitude and presence of mind did not forsake her: She contrived to make her escape from her prison, and soon found herself at the head of 6000 combatants. This army, however, was defeated; and, in opposition to the advice and intreaties of all her friends, she hastily formed the resolution of taking *refuge in England*. The archbishop of St Andrew's in particular accompanied her to the border; and when she was about to quit her own kingdom, he laid hold of her horse's bridle, and on his knees conjured her to return: but Mary proceeded, with the utmost reliance on the friendship of Elizabeth, which had been offered to her when she was a prisoner, and of the sincerity of which she harboured not a doubt.

That princess, however, who had not yet forgotten her assumption of the title and arms of queen of England, was now taught to dread her talents and to be envious of her charms. She therefore, under various pretences, and in violation not only of public faith, but even of the common rights of hospitality, kept her a close prisoner for 19 years; encouraged her rebellious subjects to accuse her publicly of the murder of her husband; allowed her no opportunity of vindicating her honour; and even employed venal scribblers to blast her fame. Under this unparalleled load of complicated distress, Mary preserved the magnanimity of a queen, and practised with sincerity the duties of a Christian. Her sufferings, her dignified affability, and her gentleness of disposition, gained her great popularity in England, especially among the Roman Catholics; and as she made many attempts to procure her liberty, and carried on a constant correspondence with foreign powers, Elizabeth became at last so much afraid of her intrigues, that she determined to cut her off, at whatever hazard. With this view she prevailed upon her servile parliament to pass an act which might make Mary answerable for the crimes of all who should call themselves her partizans; and upon that flagitious statute she was tried as a traitor concerned in the conspiracy of Babington: (see SCOTLAND). Though the trial was conducted in a manner which would have been illegal even if she had been a subject of England, and though no certain proof appeared of her connection with the conspirators, she was, to the amazement of Europe, condemned to suffer death.

The fair heroine received her sentence with great

composure; saying to those by whom it was announced, "The news you bring cannot but be most welcome, since they announce the termination of my miseries. Nor do I account that soul to be deserving of the felicities of immortality which can shrink under the sufferings of the body, or scruple the stroke that sets it free." On the evening before her execution, for which, on the succeeding morn, she prepared herself with religious solemnity and perfect resignation, she ordered all her servants to appear before her, and drank to them. She even condescended to beg their pardon for her omissions or neglects; and she recommended it to them to love charity, to avoid the unhappy passions of hatred and malice, and to preserve themselves steadfast in the faith of Christ. She then distributed among them her money, her jewels, and her clothes, according to their rank or merit. She wrote her will with her own hand, constituting the duke of Guise her principal executor; and to the king and queen of France she recommended her son, provided he should prove worthy of their esteem.—In the castle of Fotheringay she was beheaded on the 8th of February 1587, in the 45th year of her age; and her body, after being embalmed and committed to a leaden coffin, was buried with royal pomp and splendor in the cathedral of Peterborough. Twenty years afterwards her bones were by order of her son and only child King James I. removed to Westminster, and deposited in their proper place among the kings of England.

The general character of Mary, which in the regular order of biography should now be laid before the reader, has furnished matter of controversy for 200 years. She is universally allowed to have had considerable talents, and a mind highly cultivated. By one party she is painted with more virtues and with fewer defects than almost any other woman of the age in which she lived. By another she is represented as guilty of the grossest crimes which a woman can commit—adultery and the murder of her husband. By all it is confessed, that, previous to her connection with the earl of Bothwell, her life as a Christian was exemplary, and her administration as a queen equitable and mild; and it has never been denied that she bore her tedious sufferings with such resignation and fortitude as are seldom found united with conscious guilt. These are strong presumptions of her innocence. The moral characters of men change by degrees; and it seems hardly consistent with the known principles of human nature, that any person should at once plunge deliberately from the summit of virtue to the depths of vice; or, when sunk so low, should by one effort recover his original state of elevation. But in this controversy presumptions must go for nothing. The positive evidences which were brought against the queen of Scots are so conclusive, that if they be genuine she must have been guilty; and if they be spurious, there can be no doubt of her innocence. They consisted of a box with letters, contracts, and sonnets, said to be written by herself and sent to the earl of Bothwell. In addition to these, the supposed confessions of the criminals who had suffered for the king's murder were originally urged as proofs of her guilt: but those confessions are now admitted by all parties to be either wholly forged, or so grossly interpolated that no stress whatever can be laid upon them; and during Mary's life it was affirmed

Mary.

Mary. — firmed by her friends, and not sufficiently contradicted by her enemies, that the persons who had accused Bothwell, and were doubtless his accomplices, instead of criminating the queen, had openly protested her innocence in their dying moments.

Stuart's History of Scotland. — This box then, with its contents, was the evidence upon which her accusers had the chief and indeed the only reliance; and it is upon this evidence, whatever it be, that the guilt or innocence of the Scottish princess must finally be determined. It is uniformly affirmed upon the part of the earl of Murray and his faction, that the casket with the letters and the sonnets had been left by Bothwell in the castle of Edinburgh; that this nobleman, before he fled from Scotland, sent a messenger to recover them; and that they were found in the possession of this person. The 20th day of June 1567 is fixed as the date of this remarkable discovery. The governor of the castle at that time was Sir James Balfour. George Dalglish, a servant of Bothwell's, is named as his messenger upon this errand. He was seized, it is said, by the domestics of the earl of Morton; and it was the earl of Morton himself who made the actual production of the casket and its contents.

Whitaker's Vindication.

This story is unsupported by vouchers, contains improbabilities, and cannot be reconciled with history and events. There remains not any authentic or unsuspicious evidence that the queen had dishonoured the bed of Lord Darnley; and there is the most satisfactory evidence†, that though Bothwell was entrusted with the defence of the borders on account of his tried courage and loyalty, he was privately disliked by Mary for his uncommon zeal in the cause of Protestantism. At the very time when the queen is said to have had the most violent love for that nobleman, and with him to have been carrying on the most criminal intercourse against her husband, we know both from Randolph and from Knox, that Bothwell refused to gratify her by the smallest compliance with the ceremonies of her religion, though many of the other Protestant peers scrupled not to accompany her to the celebration of the mass. That the villain who could deliberately commit murder, should be so scrupulously conscientious with respect to modes of faith and worship, as to stand forward with a peculiar strain of bravery to oppose, in a favourite measure, the queen, who was then admitting him to her bed, and actually forming plans for raising him to her throne, is surely, to say the least of it, extremely improbable.

But let us suppose this non-compliance on the part of Bothwell to have been a measure concerted between the queen and him to conceal more effectually from the eyes of the public the criminal intercourse in which they were engaged; is it not very surprising, that of such politicians, the one should have written those letters, and the other have left them in the power of their enemies? The earl of Bothwell was exposed to more than suspicions of a concern in the murder of the king. These papers contained manifest proofs of his guilt. It evidently was not his interest to preserve them: or admitting, that till his marriage was solemnized with the queen he might look upon them as his best security for the realising of his ambitious hopes, yet, after that event, when all his former friends had deserted him, he must have felt the strongest inducements to destroy such a criminal correspon-

dence; and Mary must have been ardently animated with the same wish. The castle of Edinburgh, where the box is said to have been lodged, was at this time entirely at their command; and Sir James Balfour, their deputy, was the creature of Bothwell. If his enemies, who were now in arms against him, should possess themselves of this box and its contents, his destruction was inevitable. From his marriage till the 5th day of June, it was in his power to have destroyed the fatal papers; and if they had existed, it is not to be imagined that he would have neglected a step so expedient, not only for his own security and reputation, but also for those of the queen. During all this time, however, he made no effort to recover his box and letters: he had lodged them in the castle of Edinburgh; and there he chose to leave them in the custody of a man in whom he could not have one particle of affiance. This was excessively foolish; but his subsequent conduct was still more so. Upon the 6th day of June, it is evident that he had reason to suspect the fidelity of Sir James Balfour, since he avoided to take refuge in the castle of Edinburgh and fled to Dunbar. He returned, however, with an army in order to fight the rebels. The balance of empire might then seem to hang suspended between himself and his enemies; and in that state of things, a man of such commodious principles as Balfour appears to have been, might be inclined to do his old friend and patron a secret service, both to efface his former perfidy and to create himself a new interest with him in case he should be victorious over the rebels. Yet in these critical moments Bothwell neglected to make any application to him for the casket and the letters! On the 15th of June, all his towering imaginations were at once dashed to the ground. He had come to Carberry-hill, followed by an army and accompanied by a queen; but he fled from it attended only by a single servant, and was glad to shelter himself in the castle of Dunbar from the vengeance due to his crimes. Yet in this extremity of distress he is represented as trying a bold experiment, which he had not courage to try when he was fortified with the authority of his sovereign, and when he was facing the rebels in the field. In the very hour when almost every friend had deserted him, he expected a return of friendship from a man who had deserted him at first only because he suspected him to be in danger. At this period he sent his servant George Dalglish to wait upon Balfour, the acting governor of the castle of Edinburgh, with a requisition for the box of letters, and to bring back the important charge, through ten thousand dangers, to Dunbar. Though this man was one of his agents in the murder of the king, and might therefore have been safely entrusted with any secret, he did not order him, as common sense requires he should have done, to destroy the letters as soon as he should get them into his possession. No! he sent him to fetch them from the castle, as if there was no danger in going thither, no doubt of receiving them there, and no difficulty in carrying them back. † To † a traveller in an easy chair, all roads are smooth, and all days are fine. Accordingly this same Dalglish, though the well known servant of Bothwell, makes good his entrance at the gates of the city, though these were guarded by 450 harquebusiers all hostile to his

Mary.

Whitaker's Vindication.

Mary. his master, finds his way to the castle, and delivers his message. But what is more astonishing than all, he actually receives the box of letters from Sir James Balfour. This indeed, says Mr Whitaker, is "o'er-doing Termagant; it out-herods Herod." Balfour was the ductile slave of selfishness. He had with infinite perfidiousness turned against his friend, his patron, and his queen, only because he saw them opposed by a party which he *thought* would prove too strong for them; but now when they were both plunged into the lowest state of distress, and branded with the appellation of regicides, his selfishness was suddenly changed into generosity, his meanness gave place to exalted sentiments, and, at the peril of his own life, he performed an heroic act of kindness! "In such circumstances (asks a contemporary writer), is it to be thought, either that the earl would send to the said Sir James, or that the said Sir James would send any thing to the earl? Is it likely? Is it credible?" No matter: Bothwell is made to send for his papers at a time when his difficulties and his despair render it *improbable* that he could *think* of them, and when it was absolutely *impossible* that he could *recover* them. His messenger accordingly is intercepted with the casket; and the adversaries of the queen, upon the 20th day of June, became possessed of vouchers with which they might operate her destruction. These inconsistencies are glaring, and of a force not easily to be controuled; and the story is open to other objections, which are, if possible, greater, and altogether insurmountable.

By comparing different proclamations of the rebels with the several dispatches of Throgmorton, who was then Elizabeth's resident in Scotland, Mr Whitaker has made it appear in the highest degree probable, that Dalglish was *not* seized till the 17th of July; that he was then, in consequence of an order issued by the court of session, apprehended, together with Powrie, another of Bothwell's servants, in that nobleman's lodgings in the palace of Holyroodhouse; and that therefore he could not be the bearer of the letters intercepted by the earl of Morton on the 20th of June. What adds greatly to this probability is the account which the rebels themselves give of his examination. A few days after he was taken, he was examined, say they, judicially, in a council where the earls of Morton and Athol are marked as present. It was natural upon this occasion to make inquiries about the casket and the papers. No questions, however, were put to him on that subject. He was not confronted with Sir James Balfour, from whom he had received the casket; nor with the domestics of the earl of Morton, by whom it was said that he had been apprehended. He was kept in prison many months after this examination; and during a period when the rebels were infinitely pressed to apologize for their violence against the queen, there were opportunities without number of bringing him to a confession. These opportunities, however, were avoided; and there exists not the slightest evidence that the casket and the papers had ever been in his possession. Is it then to be supposed, that if the casket and the papers had really been discovered with *him*, the establishment of a fact so important would have been neglected by the adversaries of the queen? No! they would have established

it by the most complete evidence; which they were so far from attempting to do, that the earliest account which they give of their pretended seizure of the letters is dated *fifteen months* after the event itself, and nearly *nine months* after the death of Dalglish. To have blazoned their discovery at the time they pretend it was made, might have been attended with very disagreeable consequences; for Dalglish, who at his execution asserted the innocence of the queen, and actually charged the earls of Murray and Morton as the contrivers of the murder, might have found proof that the casket could not possibly have been intercepted in his custody.

The 20th of June 1567 is fixed as the æra of the discovery of the letters. If this discovery had been real, the triumph of the enemies of the queen would have been infinite. They would not have delayed one moment to proclaim their joy, and to reveal to her indignant subjects the fulness and the infamy of her guilt. They preserved, however, a long and a profound silence. It was not till the 4th of December 1567 that the papers received their first mark of notice or distinction; nor till the 16th of September 1568, that the earl of Morton was said to have intercepted them with Dalglish. From the 20th day of June to the 4th day of December, many transactions and events of the highest importance had taken place; and the most powerful motives that have influence with men had called upon them to publish their discovery. They yet made no production of the papers, and ventured not to appeal to them. In the proclamation which they issued for apprehending Bothwell, they inveigh against his guilt, and express an anxious desire to punish the regicides: yet though this deed was posterior to the 20th of June, there is no assertion in it to the dishonour of the queen; and it contains no mention of the box and the letters. An ambassador arrived in this interval from France, to inquire into the rebellion and the imprisonment of the queen; yet they apologized not for their conduct by communicating to him the contents of the casket. To Throgmorton, who had instructions to act with Mary as well as with her adversaries, they denied the liberty of waiting upon her at Lochleven, where she was detained a close prisoner; and they were earnest to impress him with the idea that her love of Bothwell was incurable. He pressed them on the subject of their behaviour to her. At different times they attempted formally to vindicate themselves; and they were uniformly vehement on the topic of the love which she bore to that nobleman. Yet they abstained from producing the letters to him. "They even spoke of her to him with *respect* and *reverence*;" which surely they could not possibly have done had they been then in possession of the letters. They were solicitous to divide the faction of the nobles who adhered to the queen; and there could not have been a measure so effectual for this end as the production of the casket and its contents: yet they called no convention of her friends, to surprise and disunite them with this fatal discovery. They flattered the Protestant clergy, attended assemblies of the church, instilled into them a belief of the queen's being guilty of murder and adultery, and incited Mr Knox to "inveigh against her vehemently in his sermons, to persuade ex-
tremities

Mary.

Mary. tremities towards her, and (as Throgmorton continues) to threaten the great plague of God against the whole country and nation if she should be spared from her *condign punishment*; but they ventured not to excite the fury of these ghostly fathers by exhibiting to them the box and the letters. They compelled the queen to subscribe a resignation of her crown; and they had the strongest reason to be solicitous to justify this daring transaction. The box and the letters would have served as a complete vindication of them: yet they neglected to take any notice of these important vouchers; and were contented with resting on the wild and frivolous pretence that the queen, from sickness and fatigue, was disgusted with the care of her kingdom.

† Robertson's
Dissertation,
3th edit.

To the irrefragable proof of the forgery of the letters arising from their having been so long concealed, it has been replied, that the rebels could not produce them sooner with any regard to their own safety. "† A considerable number of their fellow-subjects, headed by some of the most powerful noblemen in the kingdom, was combined against them. This combination they could not hope to break or to vanquish without aid either from France or England. In the former kingdom, Mary's uncles, the duke of Guise and the cardinal of Lorraine, were at that period all-powerful, and the king himself was devotedly attached to her. The loading the queen, therefore, with the imputation of being accessory to the murder of her husband, would be deemed such an inexpiable crime by the court of France, as must cut off every hope of countenance or aid from that quarter. From England, with which the principal confederates had been long and intimately connected, they had many reasons to expect more effectual support; but, to their astonishment, Elizabeth condemned their proceedings with asperity. Her high notions of royal authority, and of the submission due by subjects, induced her on this occasion to exert herself in behalf of Mary, not only with sincerity but with zeal: she negotiated, she solicited, she threatened. From all these circumstances, the confederates had every reason to apprehend that Mary would soon obtain her liberty, and by some accommodation be restored to the whole, or at least to a considerable portion, of her authority as sovereign; and *therefore* they were afraid of the consequences of accusing her publicly of crimes so atrocious as adultery and murder."

This apology for the rebels consists of assertions for which there is no evidence, and of arguments which are wholly untenable. There is no evidence that Elizabeth exerted herself in behalf of Mary with sincerity and with zeal. If she had, she would have done more than threaten. An English army of 3000 men, aided by the Scottish combination which continued faithful to the queen, would have overturned the rebel government in the space of a month. It is inconceivable that the rebels were prevented by any apprehension of the queen's restoration from accusing her of the crimes of murder and adultery; for we learn from a dispatch of Throgmorton's dated the 19th of July 1567, that "men of good regard did then boldly and overtly by their speech, utter great rigour and extremity against their sovereign; saying, it shall not be in the power of any *within* this realm, neither *without*, to keep her from condign pu-

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nishment for her notorious crimes." From another dispatch of the same ambassador's, dated five days after the former, we learn, that through him they *actually did* accuse her to Elizabeth of "incontinency, as well with the earl of Bothwell as with others, and likewise of the murder of her husband, of which, they said, they had as apparent proof against her as might be; as well by the testimony of *her own hand-writing*, which they had recovered, as also by sufficient witnesses." This testimony, however, was not produced till more than four months afterwards; a certain proof, that though it was now in the hands of the manufacturers, it was not yet ready for inspection.

But let us take the facts of this ablest antagonist of Mary as he has stated them, and consider the argument which they are made to support. It is apparent, from the last quoted dispatch of Throgmorton †, that it could not be unknown, either to the court of France or the court of England, that the rebels were at all events determined to crown the prince, and either to put the queen to death or to keep her a close prisoner for life. These desperate enterprises, however, could not, it seems, be carried into effect without the countenance and aid of Elizabeth or Charles: but Elizabeth's notions of regal authority, and of the submission due by subjects, were high; and the French king was devotedly attached to the dethroned queen. If this was so, common sense says, that the business of the confederates, since they expected aid from these princes, was to charge Mary at once with the murder and adultery, and support the charge with the most convincing evidence which they had to produce. No! says this apologist of theirs, Charles IX. would have considered such conduct as a crime inexpiable, though he might *reasonably* be expected to give them his countenance in putting to death, or keeping in perpetual prison, for a comparatively venial offence, the queen to whom he was devotedly attached! This is strange reasoning; but it seems not to have occurred to the rebels themselves. The letters made their first appearance in a secret council assembled by the earl of Murray on the 4th of December 1567; and the reason there assigned by the confederates for their unwillingness to produce them was, "That luif they beare unto hir person, wha sometime was their sovereigne, and for the reuerance of his majestie, whais moder she is, as alsua thay mony gude and excellent gifts and vertues quherewith God sometimes indowit hir." And they proceed to say, that they would not have produced them at all, "gif otherwise the sinceritie of their intentions and proceedings from the beginnunge myht be known to forrein nacions and the inhabitants of this ile (of whome mony yet remains in suspence in judgment) satisfiet and resolvit of the richtnesness of their quarrel, and the securitie of them and their posteritie be ony other meane might be providit and established." So far were they from dreaming that the production of the letters would injure their cause in the court of France, that we see they frankly acknowledged that the sincerity and rectitude of their proceedings could not otherwise be manifested to foreign nations. In this instance they think and talk like reasonable men; but they do not long preserve the same consistency.

In this act of council the rebels discover the greatest anxiety for their pardon and security: And "the matter

Mary. mattter being largelie and with gude deliberacion ressonit at great length, and upon sundry daies; at last all the said lords, barrones, and others above ex- premit, can find no other way or moeyn how to find or make the said securitie but be oppynynge and re- veling of the truth and *grund of the baill matter fre the be- ginninge*, plainlie and uprightlie, &c. Therefore the lords of secrete council, &c. desires it to be found and declarit be the estates and haill body of the parlia- ment, that the cause and occasion of the tacking of the queen's person upon the 15th daie of Junii last by past, and holding and detaininge of the same within the hous and place of Lochlevin continewallie sensyne, presentlie, and in *all tymes comyng*; and generally all other things *inventit*, spokin, writtin, or donne be them, or onny of them, sen the tent daie of February last by past unto the daie and date *heirof*, towiching the said queen hir person: that caus, and all things depending theiron, or that onie wise maie apperteine theireto, &c. was in the said queen's awin default, in as far as be **DIVERS HIR PRIVIE LETTERS WRITTEN AND SUBSCRIVIT WITH HIR AWIN HAND**, and sent by her to James Erll Bothwell, &c.—and be her un- godlie and dishonourable proceedinge in a privait mar- riage, soddanlie and unprovistly, it is most certain, that she was previe, art and part, and of the actual devise and deid of the for-mencionit murther of the kinge, her lawchfull husband, our sovereine lorde's father, committit be the said James Erll Bothwell, &c."

Had the letters been really genuine, into the ab- surdity of this declaration no man of common sense could possibly have fallen. Truth is always consistent with itself; but in a series of forgeries contradictions are scarcely avoidable. The confederates rose in re- bellion against the queen on the 10th of June; they faced her in rebellion at Carberrie-hill on the 15th; they sent her away into prison on the 16th: yet they afterwards justified *all* that they had done since the *tenth of February* by letters, which, they *said*, they had not till the *twentieth of June*! "This (says Mr Whitaker), if we consider it as folly, is one of the most striking and eminent acts of folly that the world has ever beheld. But it ought to be considered in a light much more dishonourable to the rebels; and as knavery, it is one of the rankest that has ever been attempted to be imposed upon the sons of men." On the 4th of De- cember, it must be remembered that they had not fixed *any day* for the discovery of the letters. The story of the seizure of Dalgleish with the casket was not thought of till near a year afterwards; and when it was invent- ed, they had certainly forgotten the date of their act of council. In that act, therefore, they were free to rove at large; but they roved very incautiously. By grounding upon the letters, proceedings prior to the 10th of June, they plainly declare the discovery of these fatal papers to have been *antecedent to the twentieth*. By grounding upon them their secret messages for se- dition, their private conventions for rebellion, and "every thing *inventit*, spokin, written, or done be them, or anny of them, respecting the queen, Both- well, or Darnley, sen the *tent daie of February* last by past," they even intimate the discovery to have been previous to the murder of the king; and yet by their own accounts some of the letters were then *actually un-*

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written. This is astonishing; and shows the extreme difficulty of carrying to any length a consistent series of falsehoods. Even Murray, Morton, and Lething- ton, could not do it. They knocked down one nine- pin in endeavouring to set up another; and they final- ly threw down all, by making them mutually and suc- cessively to strike one another.

We have not yet done with this act of council. It was with a view to the approaching convention of the estates that it had been formed and managed. It was a preparation for the parliament in which the conspira- tors had secured the fullest sway, and where they pro- posed to effectuate their pardon and security, and to establish the letters as decisive vouchers against the queen. Accordingly, upon the 15th day of December 1567, the three estates were assembled. The conspira- tors invited no candid or regular investigation. The friends of the nation and of the queen were overawed. Every thing proceeded in conformity to the act of council. The conspirators, by a parliamentary decree, received a full approbation of all the severities which they had exercised against the queen. A pardon by anticipation was even accorded to them for any future cruelty they might be induced to inflict upon her.— The letters were mentioned as the cause of this singu- lar law; and this new appeal to them may be termed the second mark of their distinction. But, amidst the plenitude of their power, the conspirators called not the estates to a free and honest examination of them. This, indeed, had the letters been genuine, would have annihilated for ever all the consequence of the queen. Upon this measure, however, they ventured not. The letters were merely produced in parliament, and an act founded on them; but the queen was not brought from her confinement to defend herself, nor was any advocate permitted to speak for her. We learn from a paper of unquestionable authenticity†, that "findrie nobilmen that was her Grace's favouraris then present, buir with all (the rebel proceedings in this parliament), maist principellie for safety of hir Grace's lyfe, quhilk, or thair coming to parliament, was con- cludit and subscrivit be ane greit part of hir takeris, to be taken fra hir in meist crewel manner, as is no- tourlie known." By the power of this magic, the friends of Mary were bound fast. They durst not venture to question publicly the authenticity of the letters, from their dread of exposing the queen to the dagger of the assassin. The parliament, therefore, sustained these forgeries as vouchers of her guilt, without scrutiny or debate of any kind. The conspira- tors, who were themselves the criminals, were her accusers and her judges, and passed a law exactly in the terms in which the act of secret council had be- fore drawn it up.

It was necessary to describe the letters both in the act of council and in the ordination of parliament; and these deeds having fortunately descended to poste- rity, it is apparent, from a comparison of them, that between the 4th and the 15th days of December, the letters must have undergone very essential alterations under the management of the conspirators. In the act of council the letters are described expressly as "written and *subscrivit* with the queene's awin hand;" but in the act of parliament they are said to be only "written *helilie* with hir awin hand," and there is no

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† See *Whi- taker's Vin- dication*.

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intimation that they were *subscribed* by her. Whence arises this difference? From a *blunder* in the clerk penning the act of council, says one: From a habit contracted by the same clerk, which made him *mechanically* add *subscribed* to *written*, says another: From the *carelessness* of the writer who transcribed the copy of the act of council which has descended to us, says a third. These subterfuges have been exposed in all their weakness by Messrs Tytler and Whitaker: but in this abstract it is sufficient to observe, that they are mere suppositions, supported by no evidence; and that the copy of the act of council which we have was given to the ministers of Elizabeth by the leaders of the faction, who were neither blundering clerks, nor under the habit of mechanically adding *subscribed* to *written*. Under one form, therefore, the letters were certainly exhibited before the council, and under another form they were produced in parliament; but had they been genuine, they would have appeared uniformly with the same face. The clerk of the council was Alexander Hay, a notary public accustomed to draw up writings and to attest them; and what puts his accuracy with respect to the letters beyond all possibility of doubt, his description of them is authenticated in the fullest manner by the signatures of Murray, Morton, and a long train of others who formed the secret council. The letters, therefore, were actually presented to the secret council with the customary appendage of subscription to them. But when these artificers of fraud came to reflect more closely on the approach of parliament, and to prepare their letters for the inspection of the friends of Mary, they began to shrink at the thoughts of what they had done. To substantiate the charge by letters under her own hand, they had naturally annexed her own subscription, a letter *unsubscribed* being a solecism in evidence. But most unfortunately for the cause of complete forgery, Mary was still in possession of her own *seal*, and he who fabricated the letters was not an engraver. For this reason, "the allegit writings in form of missive letters or epistles," says the bishop of Ross, in an address to Elizabeth, "are not *sellit* nor *signetit*." They were neither attested by her subscription at the bottom, nor secured by her seal on the outside. In the secret council, where all were equally embarked in rebellion, these omissions were of no importance. But that letters, containing intimations of adultery and of murder, should be sent by the queen to the earl of Bothwell, with her *subscription* to them, and yet without any guard of a *seal* upon them, so far exceeds all the bounds of credibility, that they could not expect it to gain the belief of parliament. They were struck with the absurdity of their plan, and dreaded a detection. They were under the necessity of altering it; but they could not supply the defect of the seal. They, therefore, wrote over the letters anew, and withheld the subscription.

These letters were now as complete as the conspirators wished them; yet in this state, while they were unsubscribed and unsealed, they wanted other formalities which are usual in dispatches. They were without directions, and they had no dates. They must, therefore, have been sent by the queen to Bothwell as *open and loose papers*; yet they contained evidence against

herself, and against him, of the most horrid wickedness; and Nicholas Hubert, the person who is said to have carried most of them, was of the lowest condition, and, as Dr Robertson characterizes him, "a foolish talkative fellow." He would, therefore, surely *read* those papers, which are polluted from end to end with open and uncovered adultery, and as surely *report* their contents to others. These are most incredible circumstances, on the supposition that the letters are authentic, unless the queen was, what none of her enemies ever represented her, an absolute idiot.

The letters in their composition bear no resemblance to the other writings of the queen. They have a vulgarity, an indelicacy, and a coarseness of expression and manner, that by no means apply to her. They breathe nothing of the passion of love besides the impulses of the sensual appetite; and they represent a queen highly accomplished in love with one of her subjects, as acting with all the sneaking humility of a cottager to a peer †. A few instances will show this. † *Whitaker*
 "The devil find us," she is made to exclaim, "and God knit us togidder for ever for the maist faithful coupill that ever he unitit: *this is my feith; I will die in it.*" "I am," she says in another place, "varrey glad to wryte unto zow quhen the rest are sleipand; sen I cannot sleip as they do, and *as I wold desyre, that is, in your armes, my dear lufe.*" "Seeing to obey zow, my dear lufe, I spare nouthir honor, conscience, basarde, nor greatnes quhatsumever; *tak it, I pray zow, in gude part, as from the maist faithful luifer that ever ze had, or ever fall have.*" "Se not hir (his wife), quhais fenzeit teires suld not be sa mikle preisit nor estemit as the trew and faithful trevellis quhilk I sustine for to *merite her place.*" "God give zow, my only lufe, the hap and prosperitie quhilk your *humble* and faithful lufe desyres unto zow, who *hopis to be schortly another thing to you* for the reward of my irksome trawelles." "When I will put you out of dout, and cleir myselte, *refuse it not, my dear lufe; and suffer me to make zow some prufe be my obedience, my faithfulness, constancie, and voluntary subjection, quhilk I tak for the plesandest gude that I might resseif, gif ze will except it.*" "Such (says Mr Whitaker) was the coarse kirtle, and the homely necktie, in which these wretched representers of Mary dressed themselves up, for the exhibition of a queen dignified, refined, and elegant;—a queen whom, according to their own account, "God had indowit with mony gude and excellent gifts and virtues!"

The evidence which points to the forgery of the letters is profuse and instructive. In its separate parts, it is powerful and satisfactory †. When taken together, and in the union of its parts, it is invincible. But, amidst all its cogency and strength, there is a circumstance most peculiarly in its favour, and of which it required no aid or assistance. By this peculiarity, it is cased completely in steel, and armed at every point. The letters have come down to us in the French, the Scottish, and the Latin languages. Now the conspirators affirmed, that they were written by the queen in the French language. But by a critical examination of them in these different languages, Mr Goodall demonstrated, that the pretended French originals are a translation from the Latin of Buchanan, which

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which is itself a version from the Scotch. This is indeed acknowledged by Dr Robertson, the ablest and most persevering of all Mary's enemies, who pretends, that, so far as he knows, it never was denied. Determined, however, to support the authenticity of the letters at all events, the same elegant and ingenious writer supposes †, that the French originals are now lost, but that two or three sentences of each of those originals were retained, and prefixed to the Scottish translation; and that the French editor observing this, foolishly concluded that the letters had been written partly in French and partly in Scottish. In support of this singular hypothesis, he proceeds to affirm, that "if we carefully consider those few French sentences of each letter which still remain, and apply to them that species of criticism by which Mr Goodall examined the whole, a clear proof will arise, that there was a French copy, not translated from the Latin, but which was itself the original from which both the Latin and Scottish have been translated." He accordingly applies this species of criticism, points out a few variations of meaning between what he calls the remaining sentences of the original French and the present Latin; and thinks, that in the former he has discovered a spirit and elegance which neither the Latin nor the Scottish have retained. His critical observations have been examined by Mr Whitaker; who makes it apparent as the noon-day sun, that the Doctor has occasionally mistaken the sense of the Latin, the French, and even the Scotch; and that he has forgotten to point out either the elegance or the spirit of any particular clauses in his pretended originals. The same masterly vindicator of Mary then turns his antagonist's artillery against himself; and demonstrates, that such variations as he has thought sufficient to prove the existence of a former French copy, are not confined to the first sentence of each of the three first letters, but are extended to other sentences, and diffused over all the letters. Hence he observes, that this mode of proving will demonstrate the *present* French, and every sentence in it, to be that very original, which it primarily pretended to be, which Mr Goodall has so powerfully proved it not to be, and which even the Doctor himself dares not assert it is. Our limits will not admit of our transcribing the observations of these two illustrious critics; nor is it necessary that we should transcribe them. By acknowledging that "Buchanan made his translation, not from the French but from the Scottish copy (of which he justly observes, that, were it necessary, several critical proofs might be brought)," Dr Robertson, in effect, gives up his cause. Had there been any other French letters than the present †, what occasion had Buchanan for the Scotch, when he himself must have had possession of the originals? It is evident from Mr Anderson's account, that those letters were translated by Buchanan at London during the time of the conferences. He was one of the assistants appointed to the rebel commissioners, and entrusted with the whole conduct of the process against the queen. By him, with Lethington, Macgill, and Wood, the original letters were exhibited, and their contents explained to the English commissioners; and we know from the authentic history of those papers, that they were neither lost nor mislaid for many years afterwards. It cannot be pre-

tended that Buchanan did not understand the French; for he past most of his life in that country, and taught a school there. He was, indeed, a daring zealot of rebellion; but, with all his audacity, he must have felt the task in which he was engaged a very ungracious one. When he sat down to defame, in the eyes of all Europe, a queen to whom he owed not only allegiance but also personal gratitude, it is not conceivable that he could have translated from a *Scotch translation*, had he known any thing of a *French original*; and if the rebel commissioners, who were said to produce them, knew nothing of such originals, certainly no body else ever did: if they existed not with Buchanan, they existed no where.

Dr Robertson, however, has another argument against Mr Goodall, which he thinks conclusive. Of the eight letters "the five remaining (he says) never appeared in Latin; nor is there any proof of their ever being translated into that language. Four of them, however, are published in French. This entirely overturns our author's hypothesis concerning the necessity of a translation into Latin."—An authentic fact will indeed overturn any hypothesis; but, most unhappily for this argument, the Doctor advances the hypothesis, and the fact rests with Mr Goodall. It is indeed true that Buchanan published only the three first letters in Latin at the end of his Detection; but it does not therefore follow, that the other five were never translated into that language. Indeed Mr Whitaker has made it as apparent as any thing can be, that the whole eight were turned into Latin for the use of the French translator, who, by his own account, understood not the Scotch. He has made it in the highest degree probable, that this translator was one Camuz, a French refugee; and he has demonstrated, that the translation was made in London under the eye of Buchanan himself. We do not quote his arguments, because they consist of a great number of observations which cannot be abridged; and because the translator himself confesses every thing which is of importance to the cause maintained by Mr Goodall. "Au reste (he tells us) *epistras misas sur la fin*," which were all but the eighth, "avaient été écrites par la Roynne, partie en Francois, partie en Escossois; et depuis traduites ENTIEREMENT en LATIN: mais n'ayant cognoissance de la langue Escossoise, j'ay mieux aimé exprimer TOUT ce, que j'ay trouve en LATIN, que," &c. "This confession (says Mr Whitaker) takes a comprehensive sweep. It makes all the seven letters at least, and the whole of each, to have been translated into Latin, and from thence to have been rendered into French. It starts no piddling objections about sentences or half-sentences, at the head or at the tail of any. It embraces all within its wide-spread arms. And it proves the fancied existence of a French copy at the time to be all a fairy vision; the creation of minds that have subjected their judgments to their imaginations; the invited dreams of self-delusion."

The letters, so weak on every side, and so incapable of sustaining any scrutiny, give the marks of suspicion and guilt in all the stages of their progress. Even with the parliamentary sanction afforded to them by the three estates, which the earl of Murray assembled upon the 15th day of December 1567, he felt the

Mary.

Mary. delicacy and the danger of employing them *openly* to the purposes for which they were invented. For while he was scheming with Elizabeth his accusation of the queen of Scots, he took the precaution to submit privately the letters to that princess by the agency of his secretary Mr Wood. The object of this secret transaction, which took place early in the month of June 1568, was most flagitious, and presses not only against the integrity of Murray, but also against that of the English queen. Before he would advance with his charge, he solicited from her an assurance that the judges to be appointed in the trial of Mary would hold the letters to be true and probative.

Stuart. By the encouragement of Elizabeth, the earl of Murray was prevailed upon to prefer his accusation ||. He was soon to depart for England upon this business. A privy-council was held by him at Edinburgh. He took up in it with formality the letters of the queen from the earl of Morton, and gave a receipt for them to that nobleman. That receipt is remarkable and interesting. It is dated upon the 16th day of September 1568, and contains the first mention that appears in history of the discovery of the letters as in the actual possession of Dalgleish upon the 20th of June 1567. This, as we have already noticed, is a very suspicious circumstance; but it is not the only suspicious circumstance which is recorded in the receipt. In the act of secret-council, and in the ordination of parliament, in December 1567, when the earl of Murray and his associates were infinitely anxious to establish the criminality of the queen, the only vouchers of her guilt to which they appealed were the letters; and at that time, doubtless, they had prepared no other papers to which they could allude. But in Murray's receipt in September 1568, there is mention of other vouchers beside the letters. He acknowledges, that he also received from the earl of Morton contracts or obligations, and sonnets or love-verses. These remarkable papers, though said to have been found upon the 20th of June 1567, appeared not till September 1568; and this difficulty is yet to be solved by those who conceive them to be genuine. The general arguments which affect the authenticity of the letters apply to them in full force; only it must be observed, that as the original letters were undoubtedly in Scotch, the original sonnets were as certainly written in French. This has been completely proved by Dr Robertson, and is fully admitted by Mr Whitaker, who has made it in the highest degree probable that Lethington forged the letters and Buchanan the sonnets. Be this as it may, the sonnets have every external and internal evidence of forgery in common with the letters, and they have some marks of this kind peculiar to themselves. In particular, they make the love of Mary still more grovelling than the letters made it; and with a degree of meanness, of which the soul of Lethington was probably incapable, the author of the sonnets has made the queen consider it as "na lytill honor to be maistres of her subject's gudis!" In this the dignified princess is totally lost in "the maid Marien" of her pretended imitators; and Buchanan, who in his commerce with the sex was a mere sensualist, forgot on this occasion that he was personating a lady and a queen.

There is, however, in these sonnets, one passage of

singular importance, which we must not pass wholly unnoticed. The queen is made to say,

*Pour luy aussi j'ay jetté mainte larme,
Premier qu'il fust de ce corps possesseur,
Duquel aolrs il n'avoit pas le cœur.
Puis me donna un autre dur alarme,
Quand il versa de son sang mainte dragme.*

For him also I powrit out mony teiris,
First quhen he made himself possessor of this body,
Of the quhilk then he had not the hart.
Efter he did give me ane uther hard charge,
Quhen he bled of his blude greit quantitie, &c.

If these sonnets could be supposed to be genuine, this passage would overthrow at once all the letters and both the contracts which were produced; and would prove, with the force of demonstration, that the seizure of Mary by Bothwell was *not* with her own consent; that he actually committed a *rape* upon her; that she had for him *no love*; and that she married him merely as a *refuge to her injured honour*. The sonnets, however, are undoubtedly spurious; but, considered in this light, the verses before us prove with equal force the full conviction in the minds of the rebels of what in an unguarded moment they actually confessed to Throgmorton, and was manifest to all the world: viz. that "the queen their sovereign was *led captive*, and by FEAR, FORCE, and (as by many conjectures may be well suspected) other EXTRAORDINARY and more UNLAWFUL means COMPELLED to become bed-fellow to another wife's husband." They prove likewise, that after the rape, finding Mary highly indignant at the brutality done her, Bothwell actually stabbed himself; not, we may believe, with any intention to take away his own life, but merely that by shedding many a "drachm" of blood he might mollify the heart of the queen.

But we mean not to pursue the history of the sonnets any farther. Though they were undoubtedly invented in aid of the letters, to prove that fundamental principle of the conspirators,—that the love of Mary to Bothwell was inordinate; yet they are so incompatible with history, and with one another, that they demonstrate the spuriousness of themselves, and of the evidence which they were intended to corroborate. By thus endeavouring to give an air of nature and probability to their monstrous fictions, the rebels at once betrayed the fabrication of the whole. They have themselves supplied us with a long and particular journal, to show the true dates of facts; and by that journal have their letters and their sonnets been demonstrated to be spurious. "The makers of these papers (says Mr Whitaker) have broken through all the barriers of their *own history*. They have started aside from the orbit of *their own* chronology. They have taken a flight beyond the bounds of *their own* creation, and have there placed themselves conspicuous in THE PARADISE OF FOOLS."

This mass of forgery was clandestinely shown to Elizabeth's commissioners during the conferences at York: (See SCOTLAND.) It was shown again to the same commissioners and others during the conferences at Westminster. But neither Mary nor her commissioners could ever procure a sight of a single letter or a single sonnet. By the bishop of Ross and the Lord

Herries

Mary. Herries she repeatedly demanded to see the papers said to be written by her; but that request, in itself so reasonable, Elizabeth, with an audacity of injustice of which the history of mankind can hardly furnish a parallel, thought fit to refuse. Mary then instructed her commissioners to demand copies of the letters and sonnets; and offered even from these to demonstrate in the presence of the English queen and parliament, and the ambassadors of foreign princes, that the pretended originals were palpable forgeries. Even this demand was denied her; and there is undoubted evidence still existing, that neither she nor her commissioners had so much as a copy of these criminal papers till after those important conferences had for some time been at an end. This last demand perplexed Elizabeth; the conferences were suddenly broken up; Murray was dismissed with his box to Scotland; and the letters were seen no more!

But the letters, we are told, were at Westminster compared with letters of the queen's, and found to be in the same Roman hand. They were indeed compared with other writings; but with what writings? This question let Elizabeth's commissioners themselves answer. They collated them, they say "with others her letters, which were shewed yesternight, and avowed by THEM (the rebel commissioners) to be written by the said queen." This was such a collation as must have pronounced them to be idiots §, if we had not known them to be otherwise; and such as must pronounce them to be knaves, as we know them to have been men of sense. Like persons totally incompetent to the management of business, but in truth acting ministerially in the work of profligacy, they compared the letters produced, NOT with letters furnished by Mary's commissioners, NOT with letters furnished even by indifferent persons, BUT with letters presented by the producers themselves.—"This (says Mr Whitaker) is such an instance of imposition upon Mary and the world, as can scarcely be paralleled in the annals of knavery. Many instances of imposition, indeed, occur in the wretched history of our race; but we can hardly find one, in which the imposition was so gross, so formal, so important, and so clear. It was very gross, because it has not a shred of artifice to cover its ugly nakedness. It was very formal, because it was done by men some of whom were of the first character in their country; and all were bound by honour, and tied down by oaths, to act uprightly in the business. It was very important, because no less than the reputation of a queen, and the continuance of an usurpation, depended upon it. And it is very clear, because we have the fact related to us by

the commissioners themselves, recorded to their shame in their own journal, and transmitted by their own hands to posterity with everlasting infamy on their heads."

When Tytler's *Inquiry into the Evidence produced by the Earls of Murray and Morton against Mary Queen of Scots* was first published, it was reviewed in the *Gentleman's Magazine* by the late Dr Johnson. The review, which consists of a brief analysis of the work, with reflections interspersed on the force of the evidence, concludes thus:—"That the letters were forged is now made so probable, that perhaps they will never more be cited as testimonies." Subsequent experience has shown, that the great critic's knowledge of human nature had not deserted him when he guarded his prediction with the word *perhaps*. Few authors possess the magnanimity of Fenelon; and it is not to be expected that he who has once maintained the letters to be genuine, should by reasoning or criticism be compelled to relinquish them: but we are persuaded, that, after the present generation of writers shall be extinct, these letters and sonnets will never be cited as evidence, except of the profligacy of those by whom they were fabricated. Having said this, we leave the general character of Mary to the reflection of the reader (A).

She wrote, 1. Poems on various occasions, in the Latin, French, and Scotch languages. One of her poems is printed among those of A. Blackwood; another in Brantome's *Dames illustres*, written on the death of her first husband Francis. 2. Consolation of her long imprisonment, and royal advice to her son. 3. A copy of verses, in French, sent with a diamond-ring to queen Elizabeth. There is a translation of these verses among the Latin poems of Sir Thomas Chaloner. 4. Genuine Letters of Mary queen of Scots, to James earl of Bothwell; translated from the French, by E. Simmonds, 1726. There are, besides, many other of her epistles to queen Elizabeth, secretary Cecil, Mildmaye, &c. which are preserved in the Cottonian, Ashmolean, and other libraries.

MARY II. queen of England, eldest daughter of James II. by his first wife, was born at St James's in 1662. She was bred up a Protestant, and married to William Henry of Nassau, then prince of Orange, afterward king of England, in the 16th year of her age. She staid in Holland with her husband till February 12. 1689, when she came over, and was solemnly proclaimed queen of England, &c. She was an equal sharer with her husband in all the rights belonging to the crown; but the administration and execution thereof was lodged solely in the king. She was a princess endowed with the highest

(A) This article stands in need of an apology; but whether for its length or its shortness, our readers may perhaps differ in opinion. If it be considered as a piece of common biography, and compared with the limits which we have prescribed to our other articles of the same kind, it has swelled to an extent beyond all proportion. But as a piece of common biography it ought not to be considered: it is intimately connected with the history of Scotland at a very interesting period; and it has been justly observed, by one of the ablest writers of the age, that "the fact under dispute in the life of Mary, is a fundamental and essential one; and that, according to the opinion which the historian adopts with regard to it, he must vary and dispose the whole of his subsequent narration." Viewed in this light, our abstract of the evidence which has been urged on both sides of this controversy will by many be deemed too short. To such as wish for complete satisfaction, we can only recommend the unbiassed study of the writings of Buchanan, Leslie bishop of Ross, Goodal, Robertson, Hume, Tytler, Sir David Dalrymple, Stuart, and Whitaker.

Mary
Maryland.

est perfections both of body and mind: she loved history, as being proper to give her useful instructions; and was also a good judge as well as a lover of poetry. She studied more than could be imagined, and would have read more than she did if the frequent returns of ill-humours in her eyes had not forced her to spare them. She gave her minutes of leisure to architecture and gardening; and since it employed many hands, she said she hoped it would be forgiven her. She was the most gracious of sovereigns to her subjects, and the most obliging of wives to her husband, as well as the most excellent of mistresses to her servants: she ordered good books to be laid in the places of attendance, that persons might not be idle while they were in their turns of service. She was exceeding zealous for a reformation of manners; charitable in the highest degree, without the least ostentation. This excellent queen died on the 28th of December 1695, at Kensington, of the small-pox, in the 33d year of her age. In her the arts lost a protectress, the unfortunate a mother, and the world a pattern of every virtue. As to her person, she was tall, of a majestic graceful mien, her countenance serene, her complexion ruddy, and her features beautiful.

MARY Magdalen's Day, a festival of the Romish church, observed on the 22d of July.

MARY-GERANE's-House, a name given to Dunmorehead, in the parish of Dunqueen, county of Kerry, and province of Munster, in Ireland. It is the most western point of all Europe, and called by the Irish *Ty Vorney Geerone*. It is a point as much celebrated by them as John-of-Groat's-house by the Scots, which is the utmost extremity of North Britain.

MARYBOROUGH, a borough, market, and post town, and the assizes town to the Queen's county, in the province of Leinster, in Ireland, so called in honour of Mary queen of England, who reduced this part of the country to shire-ground by act of parliament 6th and 7th Philip and Mary. It is governed by a burgo-master and bailiffs, and has a barrack for a troop of horse. It returns two members to parliament, and has five fairs. It is distant from Dublin 40 miles. N. Lat. 53. 0. W. Long. 7. 20.

MARYBURGH. See *Fort-William*.

MARYGOLD. See *Caltha*.

Corn MARYGOLD. See *Chrysanthemum*.

French MARYGOLD. See *Taygetes*.

MARYLAND, one of the Thirteen United States of America. It received that name in honour of Henrietta Maria, the consort of king Charles I. who made a grant of this country, with very extraordinary powers, to Lord Baltimore. It lies between 38 and 40 degrees north latitude, and in longitude from 74 to 78 degrees west from London. It is bounded on the north by Pennsylvania; on the east by the Delaware state; on the south-east and south by the Atlantic Ocean, and a line drawn from the ocean over the peninsula (dividing it from Accomack county in Virginia) to the mouth of Patomack river, thence up the Patomack to its first fountain, thence by a due north line till it intersects the southern boundary of Pennsylvania, in lat. 39° 43' 18"; so that it has Virginia on the south, south-west, and west. It contains about 14,000 square miles, of which about one-sixth is water. It is divided into 18 counties, 10 of which are on the

western and 8 on the eastern shore of Chesapeake bay, Maryland. St Mary's, Somerset, Calvert, Montgomery, Washington, Queen Ann's, Caroline, Kent, Charles, Talbot, Dorchester, Baltimore, Ann Arundel, Worcester, Harford, Cecil, Frederick, and Prince George's. Each of the counties sends four representatives to the house of delegates; besides which the city of Annapolis and town of Baltimore send each two, making in the whole 76 members. The climate is generally mild and agreeable, suited to agricultural productions and a great variety of fruit-trees. In the interior hilly country the inhabitants are healthy; but in the flat country, in the neighbourhood of the marshes and stagnant waters, they are, as in the other southern states, subject to intermittents. Chesapeake bay divides this state into the eastern and western divisions. It affords several good fisheries; and, in a commercial view, is of immense advantage to the state. It receives a number of the largest rivers in the United States. From the eastern shore in Maryland, among other smaller ones, it receives Pokomoke, Choptank, Chester, and Elk rivers; from the north the rapid Susquehannah; and from the west Patapsco, Severn, Patuxent, and Patomack, half of which is in Maryland and half in Virginia. Except the Susquehannah and Patomack, these are small rivers. East of the blue ridge of mountains, which stretches across the western part of this state, the land, like that in all the southern states, is generally level and free of stones. Wheat and tobacco are the staple commodities of Maryland. In the interior country, on the uplands, considerable quantities of hemp and flax are raised.

The number of inhabitants in this state, including the negroes, is 254,050; which is 18 for every square mile. The inhabitants, except in the populous towns, live on their plantations, often several miles distant from each other. To an inhabitant of the middle, and especially of the eastern states, which are thickly populated, they appear to live very retired and unsocial lives. The effects of this comparative solitude are visible in the countenances as well as in the manners and dress of the country people; there being among them very little of that cheerful sprightliness of look and action which is the invariable and genuine offspring of social intercourse; nor do they pay that attention to dress which is common, and which decency and propriety have rendered necessary, among people who are liable to receive company almost every day. As the negroes perform all the manual labour, their masters are left to saunter away life in sloth, and too often in ignorance. These observations, however, must in justice be limited to the people in the country, and to those particularly whose poverty or parsimony prevents their spending a part of their time in populous towns, or otherwise mingling with the world.

The chief towns in this state are Annapolis and Baltimore.—*Annapolis*, the capital, and the wealthiest town of its size in America, is situated just at the mouth of Severn river, 30 miles south of Baltimore. The houses are generally large and elegant; and the stadthouse is the noblest building of the kind in America.—*Baltimore* has had the most rapid growth of any town on the continent, and is the fourth in size and the fifth in trade in the United States. It lies in lat. 39. 21. on the north side of Patapsco river, around

Maryland, around what is called the Basen. The situation of the town is low. The houses were numbered in 1787, and found to be 1955; about 1200 of which were in the town and the rest at Fell's point. The number of stores was 152; and of churches 9, which belong to German Calvinists and Lutherans, Episcopalians, Presbyterians, Roman Catholics, Baptists, Methodists, Quakers, Nicolites, or New Quakers. The number of inhabitants is between 10,000 and 11,000. There are many very respectable families in Baltimore, who live genteelly, are hospitable to strangers, and maintain a friendly and improving intercourse with each other; but the bulk of the inhabitants, recently collected from almost all quarters of the world, bent on the pursuit of wealth, varying in their habits, their manners, and their religions, if they have any, are unsocial, unimproved, and inhospitable. The trade of Maryland is principally carried on from Baltimore, with the other states, with the West Indies, and with some parts of Europe. To these places they send annually about 30,000 hogheads of tobacco, besides large quantities of wheat, flour, pig iron, lumber, and corn—beans, pork, and flax-seed, in smaller quantities; and receive in return, clothing for themselves and negroes, and other dry goods, wines, spirits, sugars, and other West India commodities. The balance is generally in their favour.

The Roman Catholics, who were the first settlers in Maryland, are the most numerous religious sect. Besides these, there are Protestant Episcopalians, English, Scots, and Irish Presbyterians, German Calvinists, German Lutherans, Friends, Baptists, Methodists, and Nicolites, or New Quakers. The colleges in this state have all been founded since the year 1782, and are yet in their infancy. The names of the several seminaries are, Washington College at Chestertown, instituted in 1782; St John's College at Annapolis, founded in 1784; Cokesbury College at Abingdon, instituted by the Methodists in 1785; and a college founded by the Roman Catholics at Georgetown. There are a few other literary institutions, of inferior note, in different parts of the state, and provision is made for free schools in most of the counties: though some are entirely neglected, and very few carried on with any success; so that a great proportion of the lower class of people are ignorant, and there are not a few who cannot write their names. But the revolution, among other happy effects, has roused the spirit of education, which is fast spreading its salutary influences over this and the other southern states.

The legislature of this state is composed of two distinct branches, a senate and house of delegates; and styled *The General Assembly of Maryland*. The senate consists of 15 members, chosen every five years. Nine of these must be residents on the western shore and six on the eastern; they must be more than 25 years of age, must have resided in the state more than three years next preceding the election, and have real and personal property above the value of L. 1000. The house of delegates is composed of four members for each county, chosen annually on the first Monday in October. The city of Annapolis and town of Baltimore send each two delegates. The qualifications of a delegate are, full age, one year's residence in the

county where he is chosen, and real or personal property above the value of L. 500. The qualifications of a freeman are, full age, a freehold estate of 50 acres of land, and actual residence in the county where he offers to vote; property to the value of L. 30 in any part of the state, and a year's residence in the county where he offers to vote.

On the second Monday in November annually a governor is appointed by the joint ballot of both houses. The governor cannot continue in office longer than three years successively, nor be elected until the expiration of four years after he has been out of office. The qualifications for the chief magistracy are, 25 years of age, five years residence in the state next preceding the election, and real and personal estate above the value of L. 5000, L. 1000 of which must be freehold estate. This constitution was established by a convention of delegates at Annapolis, August 14. 1776.

Maryland was granted, as has been already noticed, by King Charles I. to Cecilius Calvert, baron of Baltimore in Ireland, June 20. 1632. The government of the province was by charter vested in the proprietary; but it appears that he either never exercised these powers alone, or but for a short time. The honourable Leonard Calvert, Esq; Lord Baltimore's brother, was the first governor or lieutenant-general. In 1638, a law was passed, constituting the first regular house of assembly, which was to consist of such representatives, called *burgesses*, as should be elected pursuant to writs issued by the governor. These burgesses possessed all the powers of the persons electing them; but by any other freemen, who did not assent to the election, might take their seats in person. Twelve burgesses or freemen, with the lieutenant-general and secretary, constituted the assembly or legislature. This assembly sat at St Mary's, one of the southern counties, which was the first settled part of Maryland. In 1689, the government was taken out of the hands of Lord Baltimore by the grand convention of England. Mr Copley was appointed governor by commission from William and Mary in 1692, when the Protestant religion was established by law. In 1716, the government of this province was restored to the proprietary, and continued in his hands till the late revolution; when, being an absentee, his property in the lands was confiscated, and the government assumed by the freemen of the province, who formed the constitution now existing. At the close of the war, Henry Hatford, Esq; the natural son and heir of Lord Baltimore, petitioned the legislature of Maryland for his estate; but his petition was not granted. Mr Harford estimated his loss of quit-rents, valued at 20 years purchase, and including arrears, at L. 259,488, 5s.—dollars at 7s. 6d. and the value of his manors and reserved lands at L. 327,441 of the same money.

MARYPORT, a sea-port town of Cumberland, situated at the mouth of the Elne. It has a good harbour; and has 70 or 80 sail of shipping from 30 to 250 tons burden, principally employed in the coal-trade; some of them sail up the Baltic for timber, flax, iron, &c. They have a furnace for cast-iron and a glass-house. A chapel was erected here in 1760.

MAS (Lewis du), natural son to Jean Louis de Montcalm.

Maryland.
Mas.

Mas,
Masfuero.

Montcahn Seigneur de Candiac, and a widow of rank of Rouergue, was born at Nîmes in 1676. His first attention was bestowed on jurisprudence; but afterwards he was altogether occupied with mathematics, philosophy, and the study of the languages. Father Mallebranche cultivated his acquaintance and esteemed his virtues. His first appearance was severe, his general temper tranquil; yet he had a lively and fertile imagination. His mind was active, full of resources, and methodical. We are indebted to his industry for the Typographical Bureau. This invention is the more ingenious, as it presents the tedious parts of education, namely, reading, writing, and the elements of languages, to the youthful mind as a delightful entertainment, and many people in France both in the capital and in the provinces have adopted it with success. After he had conceived the idea of this invention, he made the first trial of it on the young Candiac, who was remarkable for his understanding in his earliest years. Du Mas conducted his pupil to Paris and the principal cities in France, where he was universally admired. This prodigy was carried off in the year 1726 before he was seven years of age, and his loss had nearly deprived Du Mas of his reason. A dangerous illness was the consequence of his vexation; and he would have died of want, if a gentleman had not taken him from his garret and entertained him in his own house. Du Mas afterwards retired with Madame de Vaujour within two leagues of Paris, and died in the year 1774, aged 68. He was a philosopher both in genius and character. His works are, 1. *L'Art de transposer toutes sortes de Musiques sans être obligé de connoître, ni le temps, ni le mode*, published at Paris in 4to, 1711. This work is extremely curious, but of no advantage to the study of music. 2. A volume in quarto, printed at Paris 1733, in four parts, intitled, *Bibliothèque des enfans*. In this treatise he has placed, in a clear point of view, the system and economy of his Typographical Bureau. This invention, like every thing new, was censured by some and admired by others. The author himself defended it with much success in the journals and in several occasional pamphlets. This collection, however, is become exceedingly scarce. The Typographical Bureau was brought to perfection by M. Reybert a citizen of Avignon, who enriched it with many articles containing useful and agreeable information in geography, history, fable, &c. &c. 3. *Memoires de l'Ecosse sous le regne de Marie Stuart*, by Crawford, and translated from the English. This translation was found in manuscript in the library of the late marquis d'Aubais, with whom du Mas had lived in the most intimate habits of friendship.

Mas Planta, a plant which upon the same root produces male flowers only. See *MASCULUS Flos*.

MASAFUERO, an island of the South-Sea, lying in S. Lat. 33. 45. W. Long. 80. 46. It is very high and mountainous, and at a distance seems to consist of one hill or rock. It is of a triangular form, and seven or eight leagues in circumference. There is such plenty of fish, that a boat with a few hooks and lines may very soon catch as many as will serve 100 people. Here are coal-fish, cavilliers, cod, halibut, and cray-fish. Captain Carteret's crew caught a king-fisher that weighed 87 pounds, and was five feet and

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an half long. The sharks were here so ravenous, that, in taking soundings, one of them swallowed the lead, by which they hauled him above water; but he regained his liberty by disgorging his prey. Seals are so numerous here, that Captain Carteret says, if many thousands were killed in a night, they would not be missed next morning. These animals yield excellent train-oil; and their hearts and plucks are very good food, having a taste something like those of a hog; their skins are covered with a very fine fur. There are many birds here, and some very large hawks. Of the pintado bird one ship caught 700 in one night. Commodore Byron landed here with difficulty in 1765, in order to take in wood and water, of both which he found plenty. He found also great numbers of goats, whose flesh tasted as well as venison in England.

MASBOTHÆI, or MESBOTHÆI, the name of a sect, or rather of two sects; for Eusebius, or rather Hegeſippus whom he cites, makes mention of two different sects of Masbothæans. The first was one of the seven sects that arose out of Judaism, and proved very troublesome to the church; the other was one of the seven Jewish sects before the coming of Jesus Christ.

The word is derived from the Hebrew שבת, *ſchabat*, "to rest or repose," and signifies *idle easy indolent people*. Eusebius speaks of them as if they had been so called from one Masbotheus their chief: but it is much more probable that their name is Hebrew, or at least Chaldaic, signifying the same thing with a Sabbatarian in our language; that is, one who makes profession of keeping Sabbath.

Valesius will not allow the two sects to be confounded together: the last being a sect of Jews before, or at least contemporary with Christ; and the former a sect of heretics descended from them. Rufinus distinguishes them in their names: the Jewish sect he calls Masbuthæi; and the heretics Masbuthæani. The Masbuthæans were a branch of the Simonians.

MASCARDI (Augustin), a distinguished person in the republic of letters, was born at Sarzane, a city of the state of Genoa, in 1591. He spent the early part of his life among the Jesuits, and afterwards became chamberlain to Pope Urban VIII. He was naturally so eloquent, that this same pope, merely to exercise his talent, founded a professorship of rhetoric for him in the college de la Sapienza 1628, and settled upon him for life a pension of 500 crowns. Mascardi filled the chair with great reputation; but his love of letters made him neglect what is of more consequence than even letters, the management of his affairs: for he was always poor, and always in debt. He wrote a great many things in verse and prose; and among the rest, a treatise intitled *Dell' arte historica*. In his "History of the Conspiracy of the Comtede Fiesque," he has very frequently attacked the religion of Hubert Folietta; and in his other books he used some writers in the same way, which occasioned him to be attacked in his turn. The objections which were made to him, together with his answers, were added to the second edition of the history just mentioned. He died at Sarzane, 1640, in his 49th year.

MASCARON (Julius), bishop of Agen, and a most eminent French preacher, was born at Marseilles

Masbothæi
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Mascaron.

in

Masclaf,
Masculine

in 1634. He inherited of his father, who was the most celebrated advocate of the parliament of Aix, that uncommon talent of eloquence which distinguished him. He was admitted a member of the congregation of the oratory very young; and from his 22d year taught rhetoric at Mans. Soon after this he commenced preacher, and preached with great success in St Peter's church at Saumur. The bishop of Mans, willing to engage so able a preacher in his church, made him prebendary of it. He was much admired at Paris, when he preached the advent at the oratory. He preached after this five or six years at court, and was promoted to the bishopric of Tulle in 1671. He was afterwards translated to the bishopric of Agen. He was called in 1694 to preach the Lent sermon at court. The year following, he opened the assembly of the clergy, and returned to his diocese; where he died of a dropsy in his chest, Dec. 16. 1703. There is nothing printed of this great man excepting A Collection of Funeral Orations made upon the queen-mother, the dauphiness, the duke of Beaufort, the chancellor Seguier, mareschal Turenne; and at the head of this collection there is a short life of him.

MASCLEF (Francis), was at first a curate in the diocese of Amiens, the place of his birth, and afterwards theologian and confidant to the virtuous De Brou bishop of that diocese. He was appointed to the charge of a seminary of learning under that prelate. He deserved this employment both from his piety and profound learning. The oriental languages were as familiar to him as his native tongue. He pursued his researches into the idioms of the east with the spirit and the ingenuity of a philosopher. He was made canon of Amiens a little before the death of De Brou, which happened in 1706. His opinions on the Jansenist controversy were so offensive to Sabbatier, the successor of that worthy prelate, that he was removed from the care of the seminary and from almost every other public office which he held. The regard of the dead comforted Masclaf under the oppression of the living. He devoted himself to study with so much ardour, that he contracted a disease of which he died the 14th Nov. 1728, aged 66 years. His principal works are, 1. A Hebrew Grammar in Latin, after his new method, printed at Paris 1716, in 12mo. This grammar was again printed in two volumes in 12mo in the year 1730, under the direction of M. de la Bletterie at that time priest of the oratory and the friend of Masclaf. All the objections which Father Guarin made in his Hebrew grammar to Masclaf's method of reading Hebrew without the use of points are attended to in this edition. There is nothing more necessary, according to this plan, than to take the vowel which is next the consonant in the order of the alphabet. This method was approved of by some learned men, but rejected by a great many more. 2. *Les Conférences Ecclésiastiques du diocèse d'Amiens*, in 12mo. 3. *Le Catechisme d'Amiens*, in 4to. 4. *Une Philosophie et une Théologie*, in MS. These would have been published had they not discovered a partiality to the principles of Jansenism. The author was an austere man, equally respectable for his manners and his knowledge.

MASCULINE, something belonging to the male, or the stronger of the two sexes. See MALE.

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MASCULINE, is more ordinarily used in grammar to signify the first and worthiest of the genders of nouns. See GENDER. Masculine
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Masculine

The masculine gender is that which belongs to the male kind, or something analogous to it.

Most substances are ranged under the heads of masculine or feminine.—This, in some cases, is done with a show of reason; but in others is merely arbitrary, and for that reason is found to vary according to the languages and even according to the words introduced from one language into another.—Thus the names of trees are generally feminine in Latin and masculine in the French.

Farther, the genders of the same word are sometimes varied in the same language. Thus *alvus*, according to Priscian, was anciently masculine, but is now become feminine. And *navire*, “a ship,” in French, was anciently feminine, but is now masculine.

MASCULINE Rhyme, in the French poetry, is that made with a word which has a strong, open, and accented pronunciation; as all words have, excepting those which have an *e* feminine in their last syllable. For instance, *amour* and *jour*, *mort* and *fort*, are masculine rhymes; and *pere* and *mere*, *gloire* and *memoire*, are feminine. Hence also verses ending with a masculine rhyme, are called *masculine verses*, and those ending with a feminine rhyme, *feminine verses*. It is now a rule established among the French poets never to use the above two masculine or two feminine verses successively, except in the looser kind of poetry. Marot was the first who introduced this mixture of masculine and feminine verses, and Ronsard was the first who practised it with success. The masculine verses should always have a syllable less than the feminine ones.

MASCULINE Signs. Astrologers divide the signs into masculine and feminine; by reason of their qualities, which are either active, and hot or cold, accounted masculine; or passive, dry and moist, which are feminine. On this principle they call the Sun, Jupiter, Saturn, and Mars, *masculine*; and the Moon and Venus *feminine*. Mercury, they suppose, partakes of the two. Among the signs, Aries, Libra, Gemini, Leo, Sagittarius, Aquarius, are masculine: Cancer, Capricornus, Taurus, Virgo, Scorpio, and Pisces, are feminine.

MASCULUS FLOS, in botany. See FLOS.

MASH, a drink given to a horse, made of half a peck of ground malt put into a pail, into which as much scalding hot water is poured as will wet it very well: when that is done, stir it about, till, by tasting, you find it as sweet as honey; and when it has stood till it is lukewarm, it is to be given to the horse. This liquor is only used after a purge, to make it work the better; or after hard labour, or instead of drink in the time of any great sickness.

MASK. See MASQUE.

MASINISSA, a king of a small part of Africa, who at first assisted the Carthaginians in their wars against Rome; but afterwards joined the Romans, and became the firmest ally they ever had. See NUMIDIA.

MASON, a person employed under the direction of an architect, in the raising of a stone-building.

4 I

The

Masonry.

The chief business of a mason is to make the mortar; raise the walls from the foundation to the top, with the necessary retreats and perpendiculars; to form the vaults, and employ the stones as delivered to him. When the stones are large, the business of hewing or cutting them belongs to the stone-cutters, though these are frequently confounded with masons: the ornaments of sculpture are performed by carvers in stones or sculptors. The tools or implements principally used by them are the square, level, plumb-line, bevel, compass, hammer, chissel, mallet, saw, trowel, &c. See SQUARE, &c.

Besides the common instruments used in the hand, they have likewise machines for raising of great burdens, and the conducting of large stones; the principal of which are the lever, pulley, wheel, crane, &c. See LEVER, &c.

Free and Accepted MASONS, a very ancient society or body of men: so called, either from some extraordinary knowledge of masonry or building, which they are supposed to be masters of, or because the first founders of the society were persons of that profession. These are now very considerable, both for number and character, being found in every country in Europe, and consisting principally of persons of merit and consideration. As to antiquity, they lay claim to a standing of some thousand years. What the end of their institution is, seems still in some measure a secret; and they are said to be admitted into the fraternity by being put in possession of a great number of secrets, called the *mason's word*, which have been religiously kept from age to age, being never divulged. See *Free-MASONRY*.

MASONRY, in general, a branch of architecture, consisting in the art of hewing or squaring stones, and cutting them level or perpendicular, for the uses of building: but, in a more limited sense, masonry is the art of assembling and joining stones together with mortar.

Hence arise as many different kinds of masonry as there are different forms and manners for laying or joining stones. Vitruvius mentions several kinds of masonry used among the ancients: three of hewed stone, viz. that in form of a net, that in binding, and that called the *Greek masonry*; and three of unhewed stones, viz. that of an equal course, that of an unequal course, and that filled up in the middle; and the seventh was a composition of all the rest.

Plate
CCLXXX

Net-masonry, called by Vitruvius *reticulatum*, from its resemblance to the meshes of a net, consists of stones squared in their courses, and so disposed as that their joints go obliquely; and their diagonals are the one perpendicular and the other level. This is the most agreeable masonry to the eye, but it is very apt to crack. See n° 1.

Bound-masonry, that in which the stones were placed one over another, like tiles; the joints of their beds being level, and the mounters perpendiculars, so that the joint that mounts and separates two stones always falls directly over the middle of the stone below. This is less beautiful than the net-work; but it is more solid and durable. See n° 2.

Greek masonry, according to Vitruvius, is that where after we have laid two stones, each of which makes a course, another is laid at the end, which makes two

courses, and the same order is observed throughout the building; this may be called *double-binding*, in regard the binding is not only of stones of the same course with one another, but likewise of one course with another course. See n° 3.

Masonry by equal courses, called by the ancients *isodomum*, differs in nothing from the bound masonry, but only in this, that its stones are not hewn. See n° 4.

Masonry by unequal courses, called *pseudisodomum*, is also made of unhewed stones, and laid in bound work; but then they are not of the same thickness, nor is there any equality observed excepting in the several courses, the courses themselves being unequal to each other. See n° 5.

Masonry filled up in the middle, is likewise made of unhewed stones, and by courses; but the stones are only set in order as to the courses: (see n° 9). A, the courses; B, the parts filled up; C, a coat of plaster.

Compound masonry is of Vitruvius's proposing, so called as being formed of all the rest. In this the courses are of hewed stone; and the middle being left void, is filled up with mortar and pebbles thrown in together: after this the stones of one course are bound to those of another course with iron-cramps fastened with melted lead: (See n° 7). E, the stones cramped; F, the cramps; G, the middle part filled up.—N° 8. represents another sort of compound masonry, the middle of which is stone, and the edges boards.

All the kinds of masonry now in use may be reduced to these five, viz. bound masonry; that of brick-work, where the bodies and projectures of the stones inclose square spaces or pannels, &c. set with bricks; that de moilon, or small work, where the courses are equal, well squared, and their edges or beds rusticated; that where the courses are unequal; and that filled up in the middle with little stones and mortar.

Free-MASONRY, denotes the system of mysteries and secrets peculiar to the society of free and accepted masons.

The origin of this society is very ancient; but we have no authentic account of the time when it was first instituted, or even what was the reason of such an association of people under the title of *Masons*, more than of any other mechanical profession.—In Dr Henry's history we find the origin of the Free Mason Society in Britain attributed to the difficulty found in former times, of procuring a sufficient number of workmen to build the multitude of churches, monasteries, and other religious edifices which the superstition of those ages prompted the people to raise. Hence the masons were greatly favoured by the popes, and many indulgences were granted in order to augment their numbers. In times like those we speak of, it may well be supposed that such encouragement from the supreme pastors of the church must have been productive of the most beneficial effects to the fraternity; and hence the increase of the society may naturally be deduced. The Doctor quotes, in confirmation of this, the words of an author who was well acquainted with their history and constitution. "The Italians (says he), with some Greek refugees, and with them French, Germans, and Flemings, joined

Masonry. ed into a fraternity of architects, procuring papal bulls for their encouragement and their particular privileges; they styled themselves *Free-masons*, and ranged from one nation to another, as they found churches to be built: their government was regular; and where they fixed near the building in hand, they made a camp of huts. A surveyor governed in chief; every tenth man was called a *warden*, and overlooked each nine. The gentlemen in the neighbourhood, either out of charity or commutation of penance, gave the materials and carriages. Those who have seen the accounts in records of the charge of the fabrics of some of our cathedrals near 400 years old, cannot but have a great esteem for their economy, and admire how soon they erected such lofty structures."

By other accounts, however, the antiquity of masonry is carried up much higher, even as early as the building of Solomon's temple. In Britain the introduction of masonry has been fixed at the year 674, when glass-making was first introduced; and it appears indeed, that from this time many buildings in the Gothic style were erected by men in companies, who are said to have called themselves *free*, because they were at liberty to work in any part of the kingdom. Others have derived the institution of free masons from a combination among the people of that profession not to work without an advance of wages, when they were summoned from several counties, by writs of Edward III. directed to the sheriffs, to assist in rebuilding and enlarging the castle, together with the church and chapel of St George at Windsor. At this time, it is said, the masons agreed on certain tokens by which they might know and assist each other against being impressed, and not to work unless free and on their own terms.

In a treatise on Masonry published in 1792 by William Preston, master of the Lodge of Antiquity, the origin of masonry is traced from the creation. "Ever since symmetry began, and harmony displayed her charms (says he), our order has had a being." Its introduction into England he likewise supposes to have been prior to the Roman invasion. There are, according to him, the remains yet existing, of some stupendous works executed by the Britons much earlier than the time of the Romans; and even these display no small share of ingenuity of invention: so that we can have no doubt of the existence of masonry in Britain even during these early periods. The Druids are likewise said to have had among them many customs similar to those of the masons, and to have derived their government from Pythagoras; but the resemblance betwixt their usages and those of the free-mason societies now existing cannot be accurately traced even by the masons themselves.

Masonry is said to have been encouraged by Cæsar, and many of the Roman generals who were appointed governors of Britain: but though we know, that at this period the fraternity were employed in erecting many magnificent fabrics, nothing is recorded concerning their lodges and conventions; and we have but a very imperfect account of the customs which prevailed in their assemblies.

For a long time the progress of masonry in Britain was obstructed by the frequent wars which took place; and it did not revive till the time of Carausius,

by whom it was patronised. This general, who hoped to be the founder of a British empire, encouraged learning and learned men; collecting also the best artificers from many different countries, particularly masons, whom he held in great veneration, and appointing Albanus his steward the principal superintendent of their assemblies. Lodges, or conventions of the fraternity, began now to be introduced, and the business of masonry to be regularly carried on. The masons, through the influence of Albanus, obtained a charter from Carausius to hold a general council, at which Albanus himself sat president, and assisted at the reception of many new members. This Albanus was the celebrated St Alban, the first who suffered martyrdom in Britain for the Christian faith. Mr Preston quotes an old MS. destroyed with many others, said to have been in the possession of Nicholas Stone, a curious sculptor under Inigo Jones; from which we learn that St Alban was a great friend to masons, and gave them two shillings per week besides threepence for their cheer; while, before that time, they had no more than one penny per day and their meat. He likewise obtained "a charter from the king and his council for them to hold a general council, which was named an *assembly*." The same circumstances are mentioned in a MS. written in the time of James II. only this increases the weekly salary of the masons to 3s. 6d. and 3d. per day for the bearers of burthens.

The progress of masonry was greatly obstructed by the departure of the Romans from Britain; and in a short time fell into absolute neglect. This was occasioned first by the furious irruptions of the Scots and Picts, which left no time for the cultivation of the arts; and afterwards by the ignorance of the Saxons, whom the ill-advised Britons called in as allies, but who soon became their masters. After the introduction of Christianity, however, the barbarity of these conquerors began to wear off, the arts received some encouragement, and masonry particularly began to flourish. Lodges were now formed; but these being under the direction of foreigners, were seldom convened, and never attained to any degree of consideration or importance. In this situation it continued till the year 557, when St Austin, with 40 more monks, among whom the sciences had been preserved, came into England. By these the principles of Christianity were propagated with such zeal, that all the kings of the heptarchy were converted; after which masonry was taken under the patronage of St Austin, and the Gothic style of building was introduced into England by the numerous foreigners who resorted at this time to the kingdom. Austin himself appeared at the head of the fraternity in founding the old cathedral of Canterbury in 600; that of Rochester in 602; St Paul's in London in 604; St Peter's in Westminster in 605, as well as many others. The number of masons in England was thus greatly increased, as well as by his other buildings of castles, &c. throughout the kingdom.

In 640 a few expert brethren arrived from France, and formed themselves into a lodge under the direction of Bennet abbot of Wirral; whom Kenred king of Mercia soon after appointed inspector of the lodges, and general superintendent of the masons. During

Masonry the whole time of the heptarchy, however, masonry was in a low state, but began to revive in 856 under the patronage of St Swithin, whom Ethelwolf employed to repair some religious houses; and from that time the art gradually improved till the year 872, when it found a zealous protector in Alfred the Great. This prince was a most eminent patron of all kinds of arts and manufactures; and, with regard to masonry in particular, he appropriated a seventh part of his revenue for maintaining a number of workmen, whom he constantly employed in rebuilding the cities, castles, &c. ruined by the Danes. During the reign of his successor Edward, the masons continued to hold their lodges under the sanction of Ethred, husband to the king's sister, and Ethelward his brother, to whom the care of the fraternity was intrusted. The latter was a great architect, and founded the university of Cambridge.

The true re-establishment of masonry in England, however, is dated from the reign of King Athelstane; and there is still extant a grand lodge of masons at York, who trace their existence from this period. This lodge, the most ancient in England, was founded in 926, under the patronage of Edwin the king's brother, who obtained for them a charter from Athelstane, and became grand master himself. By virtue of this charter it is said, that all the masons in the kingdom were convened at a general assembly in that city, where they established a general or grand lodge for their future government. Under the patronage and jurisdiction of this lodge it is also alleged that the fraternity increased very considerably, and that kings, princes, and other eminent persons who had been initiated into the mysteries, paid due allegiance to the assembly. But as the times were yet turbulent and barbarous, the art of masonry was sometimes more sometimes less patronised; and of course the assembly more or less respected according to the respect which the art itself met with. The appellation of *ancient York masons* is well known both in Ireland and Scotland; and the general tradition is, that they originated at Auldbury near York; and as Auldbury was a seat of Edwin, this tradition gives considerable confirmation to the above account. There is indeed great reason to believe that York was the original seat of masonic government, no other place having claimed it, and the whole fraternity having at various times owned allegiance to the authority there established; though we know not whether that allegiance be now given or not. Certain it is, that if such a lodge was once established there, of which there is no reason to doubt, we have no account of its being regularly moved from that place to any other part of the kingdom with consent of its members. Many respectable meetings have indeed been held at different times in other parts of the kingdom, but there is no account of any other general meeting being held in another place than York till very lately.

While prince Edwin lived, the masons were employed as formerly in building churches, monasteries, &c. and repairing those which had suffered by the ravages of the Danes; and after his death the order was patronised by king Athelstane himself; but on his decease the masons were dispersed, and remained in an unsettled state till the reign of Edgar in 960. They

were now collected by St Dunstan, who employed **Masonry** them in works of the same kind; but as no permanent encouragement was given them, their lodges soon declined, and masonry remained in a low state for upwards of 50 years. It revived, however, in 1041, under Edward the Confessor, who superintended the execution of several great works. By the assistance of Leofrick earl of Coventry, he rebuilt Westminster Abbey, the earl being appointed superintendant of the masons; and by this architect many other magnificent structures were likewise erected. After the Conquest, in 1066, Gundulph bishop of Rochester and Roger de Montgomery earl of Shrewsbury, both of them excellent architects, became joint patrons of the masons; and under their auspices the Tower of London was begun, though finished only in the reign of William Rufus, who likewise rebuilt London Bridge with wood, and in 1087 first constructed the palace and hall of Westminster.

The masons now continued to be patronised by the sovereigns of England in succession. The lodges assembled during the reign of Henry I. and during that of Stephen, the society were employed in building a chapel at Westminster, now the House of Commons, and several other works; the president of the lodges being now Gilbert de Clare, the marquis of Pembroke. During the reign of Henry II. the lodges were superintended by the grand-master of the Knights Templars, who employed them in building their temple in Fleet-Street in the year 1155. Masonry continued under the patronage of this order till the year 1199, when John succeeded Richard I. in the throne of England, and Peter de Colechurch was then appointed grand-master. He began to rebuild London bridge with stone, which was afterwards finished by William Almain in 1209. Peter de Rupibus succeeded Peter de Colechurch in the office of grand-master, and Geoffrey Fitz-Peter, chief surveyor of the king's works, acted as deputy under him; masonry continued also to flourish under the auspices of these two artists during this and the following reign. On the accession of Edward I. in 1272, the superintendence of the masons was entrusted to Walter Giffard archbishop of York, Gilbert de Clare earl of Gloucester, and Ralph lord of Mount Hermer, the progenitor of the family of the Montagues; and by these architects the abbey of Westminster was finished, after having been begun in 1220, during the minority of Henry II. During the reign of Edward II. the fraternity were employed in building Exeter and Oriel Colleges in Oxford, Clare-hall in Cambridge, &c. under the auspices of Walter Stapleton bishop of Exeter, who had been appointed grand-master of the masons in 1307.

Edward III. was a great encourager of learning in general, and not only patronised the masons, but applied very assiduously to the constitutions of the order, revised and meliorated the ancient charges, and added several useful regulations to the original code by which the fraternity had been governed. He patronised the lodges, and appointed five deputies under him to inspect their proceedings; and at this period it appears from some old records, that the lodges were numerous, and that the fraternity held communications under the protection of the civil magistrates. William a Wykeham was continued grand-master on the accession of Richard

Masonry. Richard II. and by him both the New College in Oxford and Winchester College were founded at his own expence. After the accession of Henry IV. Thomas Fitz-Allan earl of Surrey was appointed grand-master, who, after the engagement at Shrewsbury, founded Battle-abbey and Fotheringay; the Guildhall at London being also built in this reign. On the accession of Henry V. the fraternity were directed by Henry Chicheley archbishop of Canterbury, under whom the lodges and communications of the fraternity were frequent. In 1425, however, during the reign of Henry VI. an act was made against the meetings of the chapters and congregations of masons, because it was said, that by such meetings "the good course and effect of the statutes of labourers were openly violated and broken, in subversion of the law, and to the great damage of all the commons." But this act was not put in force, nor did the fraternity cease to meet as usual under the protection of archbishop Chicheley, who still continued to preside over them. The reason of this extraordinary edict is said to have been as follows. The duke of Bedford, at that time regent of the kingdom, being in France, the regal power was vested in his brother Humphrey duke of Gloucester, who was styled protector and guardian of the kingdom. The care of the young king's person and education was entrusted to Henry Beaufort bishop of Winchester, the duke's uncle. This prelate being of an ambitious disposition, and aspiring at the sole government, had continual disputes with his nephew the protector; and by reason of the violent temper of that prince, gained frequent advantages over him. This animosity increased to such a degree, that the parliament was at length obliged to interpose. On the meeting of that assembly in the month of April 1425, however, the servants and followers of the peers came thither, armed with clubs and staves; on which account it received the name of the *Bat Parliament*, and at this time the act against masons was made. This was owing to the influence of the bishop, who wished to destroy the meetings of the fraternity on account of the secrecy observed in them. Dr Anderson, in the first edition of the Book of Constitutions, makes the following observation upon this act: "It was made in ignorant times, when true learning was a crime, and geometry condemned for conjuration; but it cannot derogate from the honour of the ancient fraternity, who, to be sure, would never encourage any such confederacy of their working brethren. By tradition, it is believed that the parliament were then too much influenced by the illiterate clergy, who were not accepted masons, nor understood architecture (as the clergy of some former ages), and were generally thought unworthy of this brotherhood. Thinking they had an indefeasible right to know all secrets by virtue of auricular confession, and the masons never confessing any thing thereof, the said clergy were highly offended; and at first, suspecting them of wickedness, represented them as dangerous to the state during that minority; and soon influenced the parliament to lay hold of such supposed arguments of the working masons for making an act that might seem to reflect dishonour upon even the whole fraternity, in whose favour several acts had been made before that period, and were made after it."

The bishop was soon after this diverted from his persecution of the masons by an affair of a more important kind. He had formed a design of surprising the city of London on the evening of St Simon and St Jude's day, that on which the Lord Mayor was invested with his office. But the plot having been discovered by the duke of Gloucester, the Mayor was sent for while at dinner, and ordered to keep a strict watch for that night. The bishop's party accordingly made an attempt to enter by the bridge about nine the next morning, but were repulsed by the vigilance of the citizens. At this the prelate was so much enraged, that he collected a numerous body of archers and men at arms, commanding them to assault the gate with shot. By the prudence of the magistrates, however, all violent measures were stopped; but no reconciliation could be procured betwixt the two parties, though it was attempted by the archbishop of Canterbury, and Peter duke of Coimbra, eldest son to the king of Portugal, with several other persons of distinction. At last the bishop wrote a letter to the duke of Bedford, urging his return to England, and informing him of the danger there was of a civil war, and reflecting upon the duke of Gloucester. This letter had the desired effect. The regent returned, and held a great council at St Albans on the 21st of February, but adjourned it to the 15th of March at Northampton, and to the 25th of June at Leicester. Bats and staves were now prohibited at these meetings; but the parties assembled with weapons no less formidable, viz. with flings, stones, and leaden plummets. The duke of Bedford employed all his authority to reconcile the differences; and at last obliged the two rivals to promise before the assembly that they would bury all animosities in oblivion. During the discussion of this matter five charges were exhibited by the duke of Gloucester against the bishop; one of which was, that "he had, in his letter to the duke of Bedford, at France, plainly declared his malicious purpose of assembling the people, and stirring up a rebellion in the nation, contrary to the king's peace." To this the bishop answered, "That he never had any intention to disturb the peace of the nation or raise a rebellion; but that he sent to the duke of Bedford to solicit his return to England, to settle all those differences which were so prejudicial to the peace of the kingdom: That though he had indeed written in the letter, 'That if he tarried, we should put the land in adventure by a field, such a brother you have here,' he did not mean it of any design of his own, but concerning the seditious assemblies of masons, carpenters, tylers, and plaisterers; who being distressed by the late act of parliament against the excessive wages of these trades, had given out many seditious speeches and menaces against certain great men, which tended much to rebellion," &c.

Notwithstanding this heavy charge, the duke of Gloucester, who knew the innocence of the parties accused, took the masons under his protection, and transferred the charge of sedition and rebellion from them to the bishop and his followers. By the interest of the latter, however, the king granted him a pardon for all offences; and though the duke drew up fresh articles of impeachment against him in 1442, and presented them in person to the king, the council, being composed

Masonry.

Masonry. composed mostly of ecclesiastics, proceeded so slowly in the business, that the duke, wearied out with the tediousness of the matter, dropped the prosecution entirely.

This contest terminated in the impeachment, imprisonment, and murder of the duke of Gloucester himself. This event might have been attended with bad consequence, had not their inveterate enemy, the prelate himself, been taken off by death in about two months after the duke. The masons then continued not only to meet in safety, but were joined by the king himself. He was, that very year (1442) initiated into masonry, and from that time spared no pains to become completely master of the art. He perused the ancient charges, revised the constitutions, and, with the consent of his council, honoured them with his sanction. The example of the sovereign was followed by many of the nobility, who assiduously studied the art. The king presided over the lodges in person, nominating William Wanefleet bishop of Winchester grand-master. This bishop at his own expence built Magdalene college, Oxford, and several religious houses. Eton-college near Windsor, and King's-college at Cambridge, were also founded during this reign. Henry himself founded Christ's-college, Cambridge, as his queen Margaret of Anjou did Queen's-college in the same university.

About this time also, the masons were protected and encouraged by James I. of Scotland, who, after his return from captivity, became a zealous patron of arts and learning of all kinds. He honoured the lodges with his royal presence, and settled an annual revenue of four pounds Scots (an English noble) to be paid by every master-mason in Scotland, to a grand-master chosen by the grand-lodge, and approved by the crown, one nobly born, or an eminent clergyman who had his deputies in cities and counties: something was likewise paid him by every new brother at his entry. His office intitled him to regulate every thing in the fraternity which could not come under the jurisdiction of law-courts; and, to prevent law-suits, both mason and lord, or builder and founder, appealed to him. In his absence, they appealed to his deputy or grand-warden, who resided next the premises.

The flourishing state of masonry was interrupted by the civil wars between the houses of York and Lancaster, which brought it almost totally into neglect. About 1471, however, it revived under the auspices of Robert Beauchamp bishop of Sarum, who had been appointed grand-master by Edward IV. and honoured with the title of *Chancellor of the Garter*, for repairing the castle and chapel of Windsor. It again declined during the reigns of Edward V. and Richard III.; but came once more into repute on the accession of Henry VII. in 1485. It was now patronised by the master and fellows of the order of St John at Rhodes (now Malta); who assembled their grand-lodge in 1500, and chose Henry for their protector. On the 24th of June 1502, a lodge of masters was formed in the palace, at which the king presided as grand-master; and having appointed John Islip abbot of Westminster, and Sir Reginald Bray knight of the garter, his wardens for the occasion, proceeded in great state to the east end of Westminster abbey,

where he laid the first stone of that excellent piece of Gothic architecture called *Henry the Seventh's Chapel*. The cape-stone of this building was celebrated in 1507. The palace of Richmond, as well as many other noble structures, were raised under the direction of Sir Reginald Bray; and the colleges of Brazen-Nose in Oxford, and Jesus and St John's in Cambridge, were all finished in this reign.

On the accession of Henry VIII. Cardinal Wolsey was appointed grand-master; who built Hampton-court, Whitehall, Christ-church college, Oxford, with several other noble edifices; all of which, upon the disgrace of that prelate, were forfeited to the crown in 1530. Wolsey was succeeded as grand-master in 1534 by Thomas Cromwell earl of Essex; who employed the fraternity in building St James's palace, Christ's hospital, and Greenwich castle. Cromwell being beheaded in 1540, John Touchet lord Audley succeeded to the office of grand-master, and built Magdalen college in Cambridge, and many other structures. In 1547, the duke of Somerset, guardian to the king, and regent of the kingdom, became superintendant of the masons, and built Somerset-house in the Strand; which, on his being beheaded, was forfeited to the crown in 1552.

After the death of the duke of Somerset, John Poynter bishop of Winchester presided over the lodges till the death of the king in 1553. From this time they continued without any patron till the reign of Elizabeth, when Sir Thomas Sackville accepted of the office of grand-master. Lodges, however, had been held during this period in different parts of England; but the general or grand lodge assembled in the city of York, where it is said the fraternity were numerous and respectable.—Of the queen we have the following curious anecdote with regard to the masons: Hearing that they were in possession of many secrets which they refused to disclose, and being naturally jealous of all secret assemblies, she sent an armed force to York to break up their annual grand-lodge. The design was prevented by the interposition of Sir Thomas Sackville, who took care to initiate some of the chief officers whom she had sent on this duty in the secrets of masonry. These joined in communication with their new brethren, and made so favourable a report to the queen on their return, that she countermanded her orders, and never afterwards attempted to disturb the meeting of the fraternity. In 1567, Sir Thomas Sackville resigned the office of grand-master in favour of Francis Russel earl of Bedford, and Sir Thomas Gresham an eminent merchant. The former had the care of the brethren in the northern part of the kingdom assigned to him, while the latter was appointed to superintend the meetings in the south, where the society had considerably increased, in consequence of the honourable report which had been made to the queen. The general assembly, however, continued to meet at York as formerly; and here all records were kept, and appeals made on every important occasion to the assembly.

Sir Thomas Gresham abovementioned proposed to erect a building in the city of London for the benefit of commerce, provided the citizens would purchase a spot proper for the purpose. Accordingly some houses

Masonry houses between Cornhill and Threadneedle-street being pulled down, the foundation-stone of the building was laid on the 7th of June 1566, and with such expedition was the work carried on, that the whole was finished in November 1567. This building, which was constructed on the plan of the exchange of Antwerp, was called at first simply *the Bourse*, but in January 1570, the queen having dined with Sir Thomas, returned through Cornhill, entered the Bourse on the south side, and having viewed every part of the building, particularly the gallery which extended round the whole structure, and which was furnished with shops filled with all sorts of the finest merchandize in the city, she caused the edifice to be proclaimed, in her presence, by herald and trumpet, the *Royal Exchange*; and on this occasion, it is said Sir Thomas appeared publicly in the character of grand-master.

The queen being now thoroughly convinced that the fraternity of masons did not interfere in state affairs, became quite reconciled to their assemblies, and from this time masonry made a considerable progress; lodges were held in different parts of the kingdom, particularly in London and its neighbourhood, where the number of the brethren increased considerably. Several great works were carried on there under the auspices of Sir Thomas Gresham, from whom the fraternity received every encouragement.

Sir Thomas was succeeded in the office of grand-master by Charles Howard earl of Effingham, who continued to preside over the lodges in the south till the year 1588, when George Hastings earl of Huntingdon was chosen grand-master, and remained in the office till the decease of the queen in 1603.

On the accession of James I. to the crown of England, masonry flourished in both kingdoms, and lodges were held in both kingdoms. A number of gentlemen returned from their travels, with curious drawings of the old Greek and Roman architecture, as well as strong inclination to revive a knowledge of it. Among these was the celebrated Inigo Jones, who was appointed general surveyor to the king. He was named grand-master of England, and was deputed by the king to preside over the lodges (A). Several learned men were now initiated into the mysteries of masonry, and the society increased considerably in reputation and consequence. Ingenious artists resorted to England in great numbers; lodges were constituted as seminaries of instruction in the sciences and polite arts after the model of the Italian schools; the communications of the fraternity were established, and the annual festivals regularly observed. Under the direction of this accomplished architect, many magnificent structures were raised; and among the rest he was employed, by command of the sovereign, to plan a new palace at Whitehall, worthy of the residence of the kings of England. This was executed; but for want of a parliamentary fund, no more of the plan was ever finished than the banqueting-house. Inigo Jones continued in the office of grand-master till the year 1618, when he was succeeded by the earl of Pembroke; under whose auspices many eminent and weal-

thy men were initiated, and the mysteries of the order held in high estimation.

After Charles I. ascended the throne, Earl Pembroke was continued in his office till the year 1630, when he resigned in favour of Henry Danvers earl of Danby. This nobleman was succeeded in 1633 by Thomas Howard earl of Arundel, the ancestor of the Norfolk family. In 1635, Francis Russell earl of Bedford accepted the government of the society; but Inigo Jones having continued to patronize the lodges during his lordship's administration, he was re-elected the following year, and continued in office till the year of his death, 1646. The progress of masonry, however, was for some time obstructed by the breaking out of the civil wars; but it began to revive under the patronage of Charles II. who had been received into the order during his exile. Some lodges during this reign were constituted by leave of the several noble grand-masters, and many gentlemen and famous scholars requested at that time to be admitted into the fraternity. On the 27th of December 1663, a general assembly was held, where Henry Jennyn earl of St Alban's was elected grand-master; who appointed Sir John Denham his deputy, and Mr Christopher Wren, afterwards the celebrated Sir Christopher Wren, and John Webb, his wardens. At this assembly several useful regulations were made, for the better government of the lodges; and the greatest harmony prevailed among the whole fraternity. The earl of St Alban's was succeeded in his office of grand-master by earl Rivers in the year 1666, when Sir Christopher Wren was appointed deputy, and distinguished himself beyond any of his predecessors in promoting the prosperity of the lodges which remained at that time, particularly that of St Paul's, now the lodge of Antiquity, which he patronized upwards of 18 years. At this time he attended the meetings regularly; and during his presidency made a present to the lodge of three mahogany candlesticks, which at that time were very valuable. They are still preserved, and highly valued as a testimony of the esteem of the donor.

The fire which in 1666 destroyed such a great part of London, afforded ample opportunity for the masons to exert their abilities. After a calamity so sudden and extensive, however, it became necessary to adopt some regulations to prevent such a catastrophe in time to come. It was now determined, that in all the new buildings to be erected, stone should be used instead of timber. Wren was ordered by the king and grand-master to draw up the plan of a city with broad and regular streets. Dr Christopher Wren was appointed surveyor-general and principal architect for rebuilding the city, the cathedral of St Paul, and all the parochial churches enacted by parliament, in lieu of those that were destroyed, with other public structures. This gentleman, however, conceiving the charge to be too important for a single person, selected for his assistant Mr Robert Hook professor of geometry in Gresham college. The latter was immediately employed in measuring, adjusting, and setting out the ground.

(A) Mr Preston observes, that the grand-master of the north bears the title of *grand-master of all England*, which (says he) may probably have been occasioned by the title of *grand-master*.

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ground of the private streets to the several proprietors. The model and plan were laid before the king and house of commons, and the practicability of the whole scheme, without any infringement of private property: but unfortunately it happened, that the greater part of the citizens were totally averse to leaving their old habitations, and building houses in other places; and so obstinate were they in their determinations, that they chose rather to have their old city again under all its disadvantages, than a new one upon the improved plan. Thus an opportunity was lost of making the new city the most magnificent as well as the most convenient for health and commerce of any in Europe. Hence the architect, being cramped in the execution of his plan, was obliged to alter and abridge it, and to model the city after the manner in which it has since appeared.—In 1673 the foundation-stone of the cathedral of St Paul's was laid with great solemnity by the king in person, and the mallet which he used on this occasion is still preserved in the lodge of Antiquity as a great curiosity.

During the time that the city was rebuilding, lodges were held by the fraternity in different places, and many new ones constituted, to which the best architects resorted. In 1674, earl Rivers resigned the office of grand-master in favour of George Villiers duke of Buckingham, who left the care of the fraternity to his wardens, and Sir Christopher Wren who still continued to act as deputy. In 1679, the duke resigned in favour of Henry Bennet earl of Arlington: but this nobleman was too deeply engaged in state affairs to attend to his duty as a mason, though the lodges continued to meet under his sanction, and many respectable gentlemen joined the fraternity. During the short reign of James II. the masons were much neglected. In 1685, Sir Christopher Wren was elected to the office of grand-master, who appointed Gabriel Cibber and Mr Edward Strong his wardens: yet notwithstanding the great reputation and abilities of this celebrated architect, masonry continued in a declining way for many years, and only a few lodges were held occasionally in different parts of the kingdom.

At the Revolution, the society was in such a low state in the south of England, that only seven regular lodges were held in London and its suburbs; and of these only two, viz. that of St Paul's and one at St Thomas's hospital, Southwark, were of any consequence. But in 1695 king William having been initiated into the mysteries, honoured the lodges with his presence, particularly one at Hampton-court, at which he is said to have frequently presided during the time that the new part of his palace was building. Many of the nobility also were present at a general assemblage and feast held in 1697, particularly Charles duke of Richmond and Lenox, who was elected grand-master for that year; but in 1698 resigned his office to Sir Christopher Wren, who continued at the head of the fraternity till King William's death in 1702.

During the reign of Queen Anne, masonry made no considerable progress. Sir Christopher's age and infirmities drew off his attention from the duties of his office, the annual festivals were entirely neglected, and the number of masons considerably diminished. It was therefore determined that the privileges of ma-

sonry should not be confined to operative masons, but that people of all professions should be admitted to participate in them, provided they were regularly approved and initiated into the order.

Thus the society once more rose into esteem; and on the accession of George I. the masons, now deprived of Sir Christopher Wren, resolved to unite again under a grand-master, and revive the annual festivals. With this view, the members of the only four lodges at that time existing in London, met at the Apple-tree tavern in Charles-street, Covent Garden; and having voted the oldest master-mason then present into the chair, constituted themselves a grand-lodge *pro tempore*. It was now resolved to renew the quarterly communications among the brethren; and at an annual meeting held on the 24th of June the same year, Mr Anthony Sayer was elected grand-master, invested by the oldest master-mason there present, installed by the master of the oldest lodge, and had due homage paid him by the fraternity. Before this time a sufficient number of masons, met together within a certain district, had ample power to make masons without a warrant of constitution; but it was now determined, that the privilege of assembling as masons should be vested in certain lodges or assemblies of masons convened in certain places, and that every lodge to be afterwards convened, excepting the four old lodges then existing, should be authorized to act by a warrant from the grand-master for the time, granted by petition from certain individuals, with the consent and approbation of the grand-lodge in communication; and that without such warrant, no lodge should hereafter be deemed regular or constitutional. The former privileges, however, were still allowed to remain to the four old lodges then extant. In consequence of this, the old masons in the metropolis vested all their inherent privileges as individuals in the four old lodges, in trust that they never would suffer the ancient charges and land-marks to be infringed. The four old lodges, on their part, agreed to extend their patronage to every new lodge which should hereafter be constituted according to the new regulations of the society; and while they acted in conformity to the ancient constitutions of the order, to admit their masters and wardens to share with them all the privileges of the grand-lodge, that of precedence only excepted.

Matters being thus settled, the brethren of the four old lodges considered their attendance on the future communications of the society as unnecessary; and therefore trusted implicitly to their masters and wardens, satisfied that no measure of importance would be adopted without their approbation. It was, however, soon discovered, that the new lodges being equally represented with the old ones at the communications, would at length so far outnumber them, that by a majority they might subvert the privileges of the original masons of England which had been centered in the four old lodges; on which account a code of laws was, with the consent of the brethren at large, drawn up for the future government of the society. To this the following was annexed, binding the grand-master for the time being, his successors, and the master of every lodge to be hereafter constituted, to preserve it inviolably; "Every annual grand-lodge has

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By this precaution the original constitutions were established as the basis of all succeeding masonic jurisdiction in the south of England; and the ancient *landmarks*, as they are called, or the boundaries set up as checks against innovation, were carefully secured from the attacks of any future invaders. No great progress, however, was made during the administration of Mr Sayer, only two lodges being constituted, though several brethren joined the old ones. In 1718 Mr Sayer was succeeded by Mr George Payne, who collected many valuable manuscripts on the subject of masonry, and earnestly requested, that the fraternity would bring to the grand lodge any old writings or records concerning the fraternity, to show the usages of ancient times: and in consequence of this invitation, several old copies of the Gothic constitutions were produced, arranged, and digested. Another assembly and feast were held on the 24th of June 1719, when Dr Desaguliers was unanimously elected grand-master. At this feast the old, regular, and peculiar toasts were introduced; and from this time we may date the rise of free-masonry on its present plan in the south of England. Many new lodges were established, the old ones visited by many masons who had long neglected the craft, and several noblemen initiated into the mysteries. In 1720, however, the fraternity sustained an irreparable loss by the burning of several valuable manuscripts, concerning the lodges, regulations, charges, secrets, &c. (particularly one written by Mr Nicholas Stone, the warden under Inigo Jones). This was done by some scrupulous brethren, who were alarmed at the publication of the masonic constitutions. At a quarterly communication it was this year agreed, that, for the future, the new grand-master shall be named and proposed to the grand lodge some time before the feast; and if approved and present, he shall be saluted as grand-master elect: and that every grand-master, when he is installed, shall have the sole power of appointing his deputy and wardens according to ancient custom.

In the mean time masonry continued to spread in the north as well as the south of England. The general assembly, or grand lodge at York, continued to meet as usual. Several lodges met in 1705, under the direction of Sir John Tempest baronet, then grand-master; and many persons of worth and character were

Masonry. initiated into the mysteries of the fraternity. The greatest harmony subsisted between the two grand lodges, and private lodges were formed in both parts of the kingdom under their separate jurisdiction. The only distinction which the grand lodge in the north appears to have retained is in the title of the *Grand Lodge of all England*; while the other was only called the *Grand Lodge of England*. The latter, however, being encouraged by some of the principal nobility, soon acquired consequence and reputation, while the other seemed gradually to decline; but, till within these few years, the authority of the grand lodge at York was never challenged; on the other hand, every mason in the kingdom held that assembly in the highest veneration, and considered himself bound by the charges which originated from that assembly. It was the glory and boast of the brethren in almost every country where masonry was established to be accounted descendants of the original York masons; and from the universality of the idea that masonry was first established at York by charter, the masons of England have received tribute from the first states in Europe. At present, however, this social intercourse is abolished, and the lodges in the north and south are almost entirely unknown to one another; and neither the lodges of Scotland nor Ireland court the correspondence of the grand lodge at London. This is said to have been owing to the introduction of some innovations among the lodges in the south; but for the coolness which subsists between the two grand lodges another reason is assigned. A few brethren at York having, on some trivial occasion, seceded from their ancient lodge, they applied to London for a warrant of constitution. Their application was honoured without any inquiry into the merits of the case; and thus, instead of being recommended to the mother-lodge to be restored to favour, these brethren were encouraged to revolt, and permitted, under the sanction of the grand lodge in London, to open a new lodge in the city of York itself. This illegal extension of power justly offended the grand lodge at York, and occasioned a breach which has never yet been made up.

The duke of Buccleugh, who in 1723 succeeded the duke of Wharton as grand-master, first proposed the scheme of raising a general fund for distressed masons. The duke's motion was supported by Lord Paisley, Colonel Houghton, and a few other brethren; and the grand lodge appointed a committee to consider of the most effectual means of carrying the scheme into execution. The disposal of the charity was first vested in seven brethren; but this number being found too small, nine more were added. It was afterwards resolved that 12 masters of contributing lodges, in rotation with the grand officers, should form the committee; and by another regulation since made, it has been determined that all past and present grand officers, with the masters of all regular lodges which shall have contributed within 12 months to the charity, shall be members of the committee. This committee meets four times in the year by virtue of a summons from the grand master or his deputy. The petitions of the distressed brethren are considered at these meetings; and if the petitioner be considered as a deserving object, he is immediately relieved with five pounds. If the circumstances of the case are of

Masonry. a peculiar nature, his petition is referred to the next communication, where he is relieved with any sum the committee may have specified, not exceeding 20 guineas at one time. Thus the distressed have always found ready relief from this general charity, which is supported by the voluntary contributions of different lodges out of their private funds, without being burdensome to any member in the society. Thus has the committee of charity for free masons been established; and so liberally have the contributions been, that though the sums annually expended for the relief of the distressed brethren have for several years past amounted to many thousand pounds, there still remains a considerable sum.

The most remarkable events which of late has taken place in the affairs of masonry, are the initiation of Omitul-Omrah Bahauder, eldest son of the nabob of the Carnatic, who was received by the lodge of Trinchinopoly in the year 1779. The news being officially transmitted to England, the grand lodge determined to send a congratulatory letter to his highness on the occasion, accompanied with an apron elegantly decorated, and a copy of the book of Constitutions superbly bound. The execution of this commission was entrusted to Sir John Dwy, advocate-general of Bengal; and in the beginning of 1780, an answer was received from his highness, acknowledging the receipt of the present, and expressing the warmest attachment and benevolence to his brethren in England. The letter was written in the Persian language, and inclosed in an elegant cover of cloth of gold, and addressed to the grand-master and grand lodge of England. A proper reply was made; and a translation of his highness's letter was ordered to be copied on vellum; and, with the original, elegantly framed and glazed, and hung up in the hall at every public meeting of the society.

After such a long history of the rise and progress of masonry, it must be natural to inquire into the uses of the institution, and for what purpose it has been patronised by so many great and illustrious personages. The profound secrecy, however, in which every thing relating to masonry is involved, prevents us from being very particular on this head. The masons themselves say, in general, that it promotes philanthropy, friendship, and morality; that in proportion as masonry has been cultivated, the countries have been civilized, &c. How far this can be depended upon, the fraternity themselves best know. Another advantage, however, seems less equivocal, viz. that its signs serve as a kind of universal language, so that by means of them people of the most distant nations may become acquainted, and enter into friendship with one another. This certainly must be accounted a very important circumstance; and considering the great number which have been, and daily are, admitted to the society, and their inviolable attachment to the art, we must certainly conclude, that if it contains nothing of great importance to mankind at large, it must at least be extremely agreeable, and even fascinating to those who are once initiated.

Egyptian Masonry, a new system of masonry taught by the celebrated impostor the Count Cagliostro.—It is not known whether this system was an invention of his own, or whether any such thing really has an

existence among the superstitious Egyptians. The scheme was first put in execution in London; and by means of his pretended knowledge in the mysteries of this art, the Count procured great sums of money, and attached to himself a vast number of followers. The following particulars concerning it were confessed by him before the inquisition at Rome.

The Egyptian masons are divided into several sects, but there are two more esteemed than the rest. The first is that of the adepts, the members of which (say the inquisitors) profess the most irreligious sentiments, and employ magic in their operations; but their principal object is the destruction of the Catholic religion and of monarchy. The members of the other pretend to be occupied about the secrets of the hermetic art, and more especially the philosopher's stone. Cagliostro owned that he was associated in London with the second of these sects; that his wife was likewise a member, and received a diploma, which cost five guineas. The lady was presented with a ribbon, on which were embroidered the words *Union, Silence, and Virtue*; and she was desired to sleep the following night with the ribbon attached to her thigh. When a male candidate is to be admitted, his courage must be tried in a number of ways. Cagliostro himself submitted to these trials; among which the following are mentioned in the account of his life. He was first hoisted up to the ceiling by means of a pulley, and, after suffering considerable pain, had his hand scorched by means of a candle. His eyes were then covered with a bandage, and he received an empty pistol, with orders to charge it. This being done, he was ordered to discharge it against his head; and upon his refusing to do so, the pistol was taken from him with contempt, but returned after a number of ceremonies. This had such an effect upon him, that without any regard to self-preservation, he drew the trigger, and got a smart stroke on the skull, which, however, produced no bad consequence. At the initiation of other candidates, he discovered that the pistol was changed, an unloaded one being put into the hands of the person when blindfolded, and that one of the assistants struck him a smart blow on the head, to make him think himself wounded. The ceremony was concluded with his taking an oath of secrecy and obedience to the grand-master.

MASORA, a term in the Jewish theology, signifying a work on the Bible, performed by several learned rabbins, to secure it from any alterations which might otherwise happen.

Their work regards merely the letter of the Hebrew text, in which they have, first, fixed the true reading by vowels and accents: they have, secondly, numbered not only the chapters and sections, but the verses, words, and letters of the text: and they find in the Pentateuch 5245 verses, and in the whole Bible 23206. The masora is called, by the Jews, the *hedge or fence of the law*, because this enumeration of the verses, &c. is a means of preserving it from being corrupted and altered. They have, thirdly, marked whatever irregularities occur in any of the letters of the Hebrew text; such as the different size of the letters, their various positions and inversions, &c. and they have been fruitful in finding out reasons for these irregularities and mysteries in them. They are, fourthly, supposed to be

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be the authors of the Keri and Chetibh, or the marginal corrections of the text in our Hebrew Bibles.

The text of the sacred books, it is to be observed, was originally written without any breaks or divisions into chapters or verses, or even into words; so that a whole book, in the ancient manner, was but one continued word: of this kind we have still several ancient manuscripts, both Greek and Latin. In regard, therefore, the sacred writings had undergone an infinite number of alterations, whence various readings had arisen, and the original was become much mangled and disguised, the Jews had recourse to a canon, which they judged infallible, to fix and ascertain the reading of the Hebrew text; and this rule they call *masora*, "tradition," from *מסר*, *tradidit*, as if this critique were nothing but a tradition which they had received from their forefathers. Accordingly they say, that when God gave the law to Moses at Mount Sinai, he taught him, first, the true reading of it; and, secondly, its true interpretation; and that both these were handed down by oral tradition, from generation to generation, till at length they were committed to writing. The former of these, viz. the true reading, is the subject of the *masora*; the latter, or true interpretation, that of the *mishna* and *gemara*.

According to Elias Levita, they were the Jews of a famous school at Tiberias, about 500 years after Christ, who composed, or at least began, the *masora*; whence they are called *masorites*, and *masoretic doctors*. Aben Ezra makes them the authors of the points and accents in the Hebrew text, as we now find it; and which serve for vowels.

The age of the *masorites* has been much disputed. Archbishop Usher places them before Jerom; Capel, at the end of the fifth century; father Morin, in the tenth century. Basnage says, that they were not a society, but a succession of men; and that the *masora* is the work of many grammarians, who, without associating and communicating their notions, composed this collection of criticisms on the Hebrew text. It is urged that there were *masorites* from the time of Ezra and the men of the great synagogue, to about the year of Christ 1030; and that Ben Asher and Ben Naphtali, who were the best of the profession, and who, according to Basnage, were the inventors of the *masora*, flourished at this time. Each of these published a copy of the whole Hebrew text, as correct, says Dr Prideaux, as they could make it. The eastern Jews have followed that of Ben Naphtali, and the western that of Ben Asher; and all that has been done since is to copy after them, without making any more corrections, or *masoretic* criticisms.

The Arabs have done the same thing by their Koran that the *masorites* have done by the Bible; nor do the Jews deny their having borrowed this expedient from the Arabs, who first put it in practice in the seventh century.

There is a great and little *masora* printed at Venice and at Basil, with the Hebrew text in a different character. Buxtorf has written a *masoretic commentary*, which he calls *Tiberias*.

MASQUE, or MASK, a cover for the face, contrived with apertures for the eyes and mouth; originally worn chiefly by women of condition, either to preserve their complexion from the weather, or out of

modesty to prevent their being known. Poppæa, wife of Nero, is said to be the first inventor of the *masque*; which she did to guard her complexion from the sun and weather, as being the most delicate woman, with regard to her person, that has been known.

Theatrical *masques* were in common use both among the Greeks and Romans: Suidas and Athenæus ascribe the invention of them to the poet Choerilus, a contemporary of Thespis; Horace attributes them to Æschylus; but Aristotle informs us, that the real inventor, and consequently the time of their first introduction and use, were unknown. Brantome observes, that the common use of modern *masques* was not introduced till towards the end of the sixteenth century.

MASQUE is also used to signify any thing used to cover the face, and prevent a person's being known. The penitents of Lyons and Avignon hide their faces with large white veils, which serve them for *masques*.

The Iron MASQUE (Masque de Fer), or *Man with the iron masque*, a remarkable personage so denominated, who existed as a state prisoner in France during the latter part of the last century. As the circumstances of this person form a historical problem which has occasioned much inquiry, and given rise to many conjectures, as well as of late, in consequence of the destruction of the Bastille, excited in a particular manner the curiosity of the public, it shall be endeavoured to condense in this article the substance of every thing material that has been published on the subject. We shall first relate such particulars concerning this extraordinary prisoner as appear to be well authenticated; and shall afterwards mention the different opinions and conjectures that have been entertained with regard to his real quality, and the causes of his confinement.

I. The authenticated particulars concerning the *iron Masque* are as follows:—A few months after the death of Cardinal Mazarine, there arrived at the isle of Sainte Marguerite, in the sea of Provence, a young prisoner whose appearance was peculiarly attracting: his person was above the middle size, and elegantly formed; his mien and deportment were noble, and his manners graceful; and even the sound of his voice, it is said, had in it something uncommonly interesting. On the road he constantly wore a mask made with iron springs, to enable him to eat without taking it off. It was at first believed that this *masque* was made entirely with iron; whence he acquired the name of "the Man with the iron mask." His attendants had received orders to dispatch him if he attempted to take off his *masque* or discover himself.—He had been first confined at Pigneol, under the care of the governor M. de St Mars; and upon being sent from thence to Sainte Marguerite, he was accompanied thither by the same person, who continued to have the charge of him. He was always treated with the most marked respect: he was served constantly in plate; and the governor himself placed his dishes on the table, retiring immediately after and locking the door behind him. He *tu-to-yoit* (thee'd and thou'd) the governor; who, on the other hand, behaved to him in the most respectful manner, and never wore his hat before him, nor sat down in his presence unless he was desired. The Marquis de Louvois, who went to see him at St Marguerite, spoke to him standing, and with that kind of attention which denotes high respect.

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Masque.

Masque.

During his residence here, he attempted twice, in an indirect manner, to make himself known. One day he wrote something with his knife on a plate, and threw it out of his window towards a boat that was drawn on shore near the foot of the tower. A fisherman picked it up and carried it to the governor. M. de St Mars was alarmed at the sight; and asked the man with great anxiety, whether he could read, and whether any one else had seen the plate? The man answered, that he could not read, that he had but just found the plate, and that no one else had seen it. He was, however, confined till the governor was well assured of the truth of his assertions.—Another attempt to discover himself proved equally unsuccessful. A young man who lived in the isle, one day perceived something floating under the prisoner's window; and on picking it up, he discovered it to be a very fine shirt written all over. He carried it immediately to the governor; who, having looked at some parts of the writing, asked the lad, with some appearance of anxiety, if he had not had the curiosity to read it? He protested repeatedly that he had not: but two days afterwards he was found dead in his bed.

The *Masque de Fer* remained in this isle till the year 1698, when M. St Mars being promoted to the government of the Bastille, conducted his prisoner to that fortress. In his way thither, he stopt with him at his estate near Palteau. The Masque arrived there in a litter, surrounded by a numerous guard on horseback. M. de St Mars eat at the same table with him all the time they resided at Palteau; but the latter was always placed with his back towards the windows; and the peasants, who came to pay their compliments to their master, and whom curiosity kept constantly on the watch, observed that M. de St Mars always sat opposite to him with two pistols by the side of his plate. They were waited on by one servant only, who brought in and carried out the dishes, always carefully shutting the door both in going out and returning. The prisoner was always masked, even when he passed through the court; but the people saw his teeth and lips, and also observed that his hair was grey.—The governor slept in the same room with him, in a second bed that was placed in it on that occasion. In the course of their journey, the iron-mask was, one day, heard to ask his keeper whether the king had any design on his life? “No, Prince,” he replied; “provided that you quietly allow yourself to be conducted, your life is perfectly secure.”

The stranger was accommodated as well as it was possible to be in the Bastille. An apartment had been prepared for him by order of the governor before his arrival, fitted up in the most convenient style; and every thing he expressed a desire for was instantly procured him. His table was the best that could be provided; and he was ordered to be supplied with as rich clothes as he desired: but his chief taste in this last particular was for lace, and for linen remarkably fine. It appears that he was allowed the use of such books as he desired, and that he spent much of his time in reading. He also amused himself with playing upon the guitar. He had the liberty of going to mafs; but was then strictly forbid to speak or uncover his face: orders were even given to the soldiers to fire upon

him if he attempted either; and their pieces were always pointed towards him as he passed through the court. When he had occasion to see a surgeon or a physician, he was obliged, under pain of death, constantly to wear his mask. An old physician of the Bastille, who had often attended him when he was indisposed, said, that he never saw his face, though he had frequently examined his tongue, and different parts of his body; that there was something uncommonly interesting in the sound of his voice; and that he never complained of his confinement, nor let fall from him any hint by which it might be guessed who he was. It is said that he often passed the night in walking up and down his room.

This unfortunate prince died on the 19th of November 1703, after a short illness; and was interred next day in the burying-place of the parish of St Paul. The expence of his funeral amounted only to forty livres. The name given him was *Marchiali*: and even his age, as well as his real name, it seemed of importance to conceal; for in the register made of his funeral, it was mentioned that he was about forty years old; though he had told his apothecary, some time before his death, that he thought he must be sixty.—It is a well known fact, that immediately after the prisoner's death, his apparel, linen, clothes matraffes, and in short every thing that had been used by him, were burnt; that the walls of his room were scraped, the floor taken up, evidently from the apprehension that he might have found means of writing any thing that would have discovered who he was. Nay such was the fear of his having left a letter or any mark which might lead to a discovery, that his plate was melted down; the glass was taken out of the window of his room and pounded to dust; the window-frame and doors burnt; and the ceiling of the room, and the plaster of the inside of the chimney, taken down. Several persons have affirmed, that the body was buried without a head; and Monsieur de Saint Foix informs us †, that “a gentleman having bribed the sexton, had the body taken up in the night, and found a stone instead of the head.”

The result of these extraordinary accounts is, that the iron masque was not only a person of high birth, but must have been of great consequence; and that his being concealed was of the utmost importance to the king and ministry. We come now, therefore, to notice,

II. The opinions and conjectures that have been formed concerning the real name and condition of this remarkable personage. Some have pretended that he was the duke of Beaufort; others, that he was the Count de Vermandois, natural son to Louis XIV. by the duchess de la Valliere. Some maintain him to have been the duke of Monmouth, natural son of Charles II. of England by Lucy Walters; and others say, that he was Gerolami Magni, minister to the duke of Modena.

Besides these conjectures, none of which possesses sufficient probability to entitle them to consideration, a fifth has been advanced; namely, That the Iron Masque was a son of Anne of Austria, queen to Louis XIII. and consequently that he was a brother of Louis XIV.; but whether a bastard brother, a brother-

Masque.

† In his *Essai sur l'Histoire des Histoires*.

Masque. ther-german, or a half brother, is a question that has given rise to three several opinions, which we shall state in the order of time in which the respective transactions to which they allude happened.

1. The first opinion is, that the queen proved with child at a time when it was evident it could not have been by her husband, who, for some months before, had never been with her in private. The supposed father of this child is said by some to have been the duke of Buckingham, who came to France in May 1625, to conduct the princess Henrietta, wife of Charles I. to England. The private letters and memoirs of those times speak very suspiciously of the queen and Buckingham: his behaviour at Amiens, whither the queen and queen-mother accompanied the princess in her way to Boulogne, *occasioned much whispering*: notwithstanding the pains that have been taken by La Porte in his *Memoires* to excuse his mistress, it appears that the king, on this occasion, was extremely offended at her, and that it required all the influence and address of the queen-mother to effect a reconciliation. It is said, that this child was privately brought up in the country; that when Mazarin became a favourite, he was entrusted with the care of him; and that Louis XIV. having discovered the secret on the death of the cardinal, thought it necessary to confine him in the manner that has been related.

Hist. of the Bastille, n° 6. P. 343.

But it may be observed, that this secret could scarcely have escaped the vigilance of the cardinal de Richlieu; and it is not improbable, that a minister so little scrupulous, if inclined to save the honour of a queen, would have removed a child, who, if he lived, might have been made use of to disturb the tranquillity of the kingdom. After this supposed birth, the queen had frequent quarrels with the king, and, what was more dangerous, with the cardinal; who even used every means in his power to enquire into her most private transactions. It was on a memorable occasion of this kind, that her servant La Porte was thrown into the Bastille; and it can scarcely be imagined she would have had the firmness she then displayed, while conscious of so much guilt, and under the risk of having it discovered. The prisoner with the masque appears, by several accounts, to have been a youth of a handsome figure in the year 1661; and in 1703, when he died, to have been above sixty; but had he been a son of Buckingham, he would have been about thirty-six in 1661, when he could not be said to have been a youth; and in November 1703, above seventy-eight.

2. The second opinion is, that he was the twin-brother of Louis XIV. born some hours after him. This first appeared in a short anonymous work published without date, and without the name of place or printer. It is therein said, "Louis XIV. was born at St Germain en Laye, on the 5th of September 1638, about noon; and the illustrious prisoner, known by the appellation of the *Iron masque*, was born the same day, while Louis XIII. was at supper. The king and the cardinal, fearing that the pretensions of a

twin-brother might one day be employed to renew those civil wars with which France had been so often afflicted, cautiously concealed his birth, and sent him away to be brought up privately. Having but an imperfect knowledge of the circumstances that followed, I shall say nothing more, for fear of committing errors; but I firmly believe the fact I have mentioned; and time will probably prove to my reader, that I have ground for what I have advanced."

This opinion has been more noticed since the publication of a work called *Memoires du Marechal Duc de Richlieu*, written by the Abbé Soulavie; concerning which it may be proper to premise, that the present duke of Richlieu, son of the marechal, disavows this work; while the Abbé Soulavie, who had been employed by the marechal, insists on the authenticity of his papers (A). He informs us, that the duke of Richlieu was the lover of Mademoiselle de Valois, daughter of the regent duke of Orleans, and afterwards duchess of Modena, who in return was passionately fond of him: that the regent had something more than a paternal affection for his daughter; and that, though she held his sentiments in abhorrence, the duke of Richlieu made use of her influence with her father to discover the secret of the prisoner with the masque: that the regent, who had always observed the most profound silence on this subject, was at last persuaded to entrust her with a manuscript, which she immediately sent to her lover, who took a copy of it. This manuscript is supposed to have been written by a gentleman on his death-bed, who had been the governor of the prisoner. The following is an extract of it, from what the Abbé Soulavie has told us.

"The birth of the prisoner happened in the evening of the 5th of September 1638, in presence of the chancellor, the bishop of Meaux, the author of the manuscript, a midwife named Peronéte, and a sieur Honorat. This circumstance greatly disturbed the king's mind; he observed, that the Salique law had made no provision for such a case; and that it was even the opinion of some, that the last born was the first conceived, and therefore had a prior right to the other. By the advice of cardinal de Richlieu, it was therefore resolved to conceal his birth, but to preserve his life, in case by the death of his brother it should be necessary to avow him. A declaration was drawn up, and signed and sworn to by all present, in which every circumstance was mentioned, and several marks on his body described. This document being sealed by the chancellor with the royal seal, was delivered to the king; and all were commanded and took an oath never to speak on the subject, not even in private and among themselves. The child was delivered to the care of Madame Peronéte the midwife, to be under the direction of cardinal de Richlieu, at whose death the charge devolved to cardinal de Mazarin. Mazarin appointed the author of the manuscript his governor, and entrusted to him the care of his education. But as the prisoner was extremely attached to Madame Peronéte, and she equally so to him, she remained with him till her death. His governor carried him to his house in Burgundy,

(A) A letter from the duke of Richlieu, and an answer from the Abbé Soulavie, appeared in the *Journal de Paris*.

Masque.

gundy, where he paid the greatest attention to his education.

"As the prisoner grew up, he became impatient to discover his birth, and often importuned his governor on that subject. His curiosity had been roused, by observing that messengers from the court frequently arrived at the house; and a box, containing letters from the queen and the cardinal, having one day been inadvertently left out, he opened it, and saw enough to guess at the secret. From that time he became thoughtful and melancholy, which (says the author) I could not then account for. He shortly after asked me to get him a portrait of the late and present king, but I put him off by saying that I could not procure any that were good. He then desired me to let him go to Dijon; which I have known since was with an intention of seeing a portrait of the king there, and of going secretly to St John de Lus, where the court then was on occasion of the marriage with the infant. He was beautiful; and love helped him to accomplish his wishes. He had captivated the affections of a young housekeeper, who procured him a portrait of the king. It might have served for either of the brothers; and the discovery put him into so violent a passion, that he immediately came to me with the portrait in his hand, saying, *Voila mon frere, et voila qui je suis*, showing me at the same time a letter of the cardinal de Mazarin that he had taken out of the box. Upon this discovery his governor immediately sent an express to court to communicate what had happened, and to desire new instructions; the consequence of which was, that the governor and the young prince under his care were arrested and confined."

This memoir, real or fictitious, concludes with saying, "I have suffered with him in our common prison: I am now summoned to appear before my Judge on high; and for the peace of my soul I cannot but make this declaration, which may point out to him the means of freeing himself from his present ignominious situation, in case the king his brother should die without children. Can an extorted oath compel me to observe secrecy on a thing so incredible, but which ought to be left on record to posterity."

3. The third opinion is, that he was a son of the queen by the cardinal de Mazarin, born about a year after the death of her husband Louis XIII.; that he was brought up secretly; and that soon after the death of the cardinal, which happened on the 9th of March 1661, he was sent to Pignerol. To this account Father Griffet* objects, "that it was needless to masque a face that was unknown; and therefore that this opinion does not merit discussion." But in answer it has been observed, That the prisoner might strongly resemble Louis XIV. which would be a sufficient reason to have him masked. This opinion is supposed to have been that entertained by Voltaire, who asserts his thorough knowledge of the secret, though he declined being altogether explicit. The Abbé Soulavie, author of Memoirs of the Marechal de Richlieu, speaking on this subject, says, "That he once observed to the Marechal, that he certainly had the means of being informed who the prisoner was; that it even seemed that he had told Voltaire, who durst not venture to publish the secret; and that he at last asked him, whether he was not the elder brother of Louis XIV. born without

the knowledge of Louis the XIII.? That the marechal seemed embarrassed, but afterwards said, that he was neither the bastard brother of Louis the XIV. nor the duke of Monmouth, nor the count of Vermandois, nor the duke of Beaufort, as different authors had advanced; that their conjectures were nothing but reveries; but added, that they however had related many circumstances that were true; that in fact the order was given to put the prisoner to death if he discovered himself; and that he finished the conversation by saying, All I can tell you on the subject is, that the prisoner was not of such consequence when he died at the beginning of the present century as he had been at the beginning of the reign of Louis the XIV. and that he was shut up for important reasons of state." The Abbé Soulavie tells us, that he wrote down what had been said, and gave it to the Marechal to read, who corrected some expressions. The Abbé having proposed some further questions, he answered, "Read what Voltaire published last on the subject of the prisoner with the masque, especially at the end, and reflect on it."—The passage of Voltaire alluded to is as follows.

"The man with the masque (says he) is an enigma of which every one would guess the meaning. Some have said that it was the duke of Beaufort; but the duke of Beaufort was killed by the Turks in the defence of Candy in 1669, and the prisoner with the masque was at Pignerol in 1661. Besides, how could the duke of Beaufort have been arrested in the midst of his army, and brought to France, without any one knowing it? and why confine him? and why that mask?—Others have dreamed that he was the count de Vermandois, natural son of Louis XIV. who died publicly at the army in 1683 of the small-pox, and was buried at the little town of Aire and not Arras; in which Father Griffet was mistaken, but in which to be sure there is no great harm.—Others have imagined, that it was the duke of Monmouth, who was beheaded publicly in London in the year 1685. But for this he must have risen again from the dead, and he must have changed the order of time, and placed the year 1662 in the room of the year 1685. King James, who never forgave any one, and who on that account deserved all that happened to him, must have pardoned the duke of Monmouth, and got another to die in his stead, who perfectly resembled him. This Sofia must first have been found, and then he must have had the goodness to let his head be cut off in public, to save the duke of Monmouth. It was necessary that all England should be mistaken; and that King James should beg of Louis XIV. to be so obliging as to be his gaoler; that Louis XIV. after having shown this trifling piece of civility to King James, should not have been wanting in the same attention to his friend King William and to Queen Anne (with both of whom he was engaged in war), and to please them, retained the dignity of gaoler, with which James had honoured him.

"All these illusions being dissipated, it then remains to know who this prisoner was, and at what age he died. It is clear, that if he was not permitted to cross the court of the Bastile, or to speak to his physician, except covered with a masque, it must have been from the apprehension that his features and countenance

Masque.

* *Traité de la Verité de l'Histoire*, p. 318. n.

Masque.

nance might have discovered some resemblance. He could show his tongue, but not his face. He said himself to the apothecary of the Bastille, a few days before his death, that he believed he was about 60. Mr Marfoban, who was son-in-law to this apothecary, and surgeon to the marechal de Richlieu, and afterwards to the regent duke of Orleans, told me this frequently. Why give him an *ITALIAN* name?—They always called him *Marchiali*. He who writes this article perhaps knows more than Father Griffet, but he will say nothing farther."

This opinion has been lately resumed, illustrated, and enforced, by M. de Saint Mihiel, in a work intitled *Le Veritable Homme*, &c. "The real Man with the Iron Masque." The author, in support of his idea, attempts to prove that Anne of Austria and Cardinal Mazarine were married. This, says he, the duchess of Orleans assures us of in three of her letters. In the first, dated Sept. 13. 1713, she expresses herself as follows: "Old Beauvais, who was first lady of the bed-chamber to the queen-dowager, was acquainted with the secret of the ridiculous marriage; this rendered it necessary for the queen to do every thing that her confidant wished; and this circumstance has given rise in this country to an extension of the rights of first ladies of the bedchamber." In the second of these letters, dated Nov. 2. 1717, she says, "The queen-mother, widow of Louis XIII. did worse than love Cardinal Mazarine; she married him, for he was not a priest: he was not even in orders; and who could have hindered her? He was most horribly tired of the good queen-mother, and lived on very bad terms with her, which is the reward that people deserve for entering into such marriages." In her third letter, dated July 2. 1719, speaking of the queen, the duchess says, "She was perfectly easy respecting Cardinal Mazarine; he was not a priest, and therefore nothing could prevent their being married. The secret passage through which the Cardinal went every evening to the queen's apartment is still to be seen at the Palais-Royal." Among other proofs besides the above, which M. de St Mihiel brings to substantiate this marriage, he observes, that Mazarine held all councils of state in his apartment whilst he was shaving or dressing; that he never permitted any person to sit down in his presence, not even the chancellor nor marshal de Villeroy; and that while they were deliberating with him on state affairs he would be often playing with his monkey or linnet. What man (continues the author) would have subjected to such humiliations a chancellor, who holds the first office in the kingdom since that of constable has been suppressed, and a marshal who was governor to the king, had he not been in reality a sovereign himself, in virtue of his being husband to the queen-regent? He therefore concludes, that the man with the iron masque was son to Anne of Austria and Cardinal Mazarine; and endeavours to justify this assertion by a variety of conjectural proofs. Of some of these we shall give a short sketch:

1. No prince, or person of any consideration, after the year 1644, at which time the man with the iron masque was born, until the time when his existence was known, disappeared in France. This personage, therefore, was not a prince or great lord of France known at that time.

Masque.

2. The man with the iron masque was not a foreigner; for foreigners, even of the highest distinction, did not at that period study the French language in such a manner as to attain so great perfection in it as to pass for Frenchmen. If this prisoner had spoken with the least foreign accent, the officers, physicians, surgeons, apothecaries, confessors, and others employed in the prisons where he was, and especially the prisoners with whom he conversed at St Margaret, would not have failed to discover it. From all this M. de St Mihiel infers that he must have been a Frenchman.

3. The existence of the man with the iron masque has been known for upwards of 90 years. Had any person of high rank disappeared at an anterior period, his friends, relations, or acquaintances, would not have failed to claim him, or at least to suppose that he was the man concealed by this masque. But no one disappeared, nor was any one claimed: the man with the iron masque was therefore a person unknown.

4. This man was not torn away from society on account of any criminal action; for when he was arrested, it was foreseen that he would cause much embarrassment, and occasion great expences. He was therefore not a criminal, else means would have been pursued to get rid of him; and consequently all the importance of his being concealed was attached solely to his person.

5. This stranger must have been a person of very high birth; for the governor of the prison St Mars behaved always to him with the greatest respect.

6. Louis XIII. played on the guitar; Louis XIV. did the same in a very masterly manner; and the man with the iron masque played also on that instrument: which gives us reason to believe that his education was directed by the same persons who had presided over that of Louis XIV. and who appear to have been the particular choice of Anne of Austria.

7. This stranger died on the 19th of November 1703; and a few days before his death, he told the apothecary of the Bastille, that he believed he was about 60 years of age. Supposing that he was then 59 and a half, he must have been born towards the end of May 1644; and if he was 60 wanting three months, he must have been born in the end of August, or the beginning of September, of the same year; a period when the royal authority was in the hands of Anne of Austria, but in reality exercised more by Mazarine than by her. "I have already proved (continues the author), that from the first day of the regency of Anne of Austria, the greatest friendship, and even intimacy, subsisted between this princess and the cardinal; that these sentiments were changed into a mutual love; and that they were afterwards united by the bonds of marriage. They might, therefore, well have a son about the month of September 1644, as Louis XIII. had been then dead more than 15 months, having died on the 15th of May the year preceding. But nothing of what I have related, or of what has been written, and acknowledged as fact, respecting the man with the iron mask, can be applied, except to a son of Mazarine and Anne of Austria. The man with the iron mask was indebted, therefore, for his existence to cardinal Mazarine, and the regent widow of Louis XIII."—To account for the

Masque. the manner in which the queen was able to conceal her pregnancy and delivery, Madame de Motteville is quoted; who relates, under the year 1644, that Anne of Austria quitted the Louvre, because her apartments there displeased her: that she went to reside at the Palais-Royal, which Richlieu, when he died, bequeathed to the deceased king: that when she first occupied this lodging, *she was dreadfully afflicted with the jaundice*: that the physicians ascribed this disorder to her dejection and application to business, which gave her much embarrassment: but that being cured of her melancholy, as well as of her malady, she resolved to think only of enjoying tranquillity; which she did, by communicating to her minister the burden of public affairs. On this quotation, M. de St Mihiel asks, "Is it not very singular, that the queen, who, during the 29 years of her former wedded state, had always resided in the Louvre, especially from 1626, when Louis XIII. ceased to cohabit with her, until their re-union, which took place in the beginning of December 1637, should have quitted it precisely in 1644, because she was displeased with her apartments? How happened it that her apartments displeased her this year, and neither sooner nor later? She might undoubtedly have had any kind of furniture there which she desired, and every alteration made according to her wishes, as she was then absolute mistress: but the cause of her determination is plain; the apartments of the Palais-Royal, which front a garden, were much more convenient for her to be delivered in secret."

8. As it is necessary that some name should be given to every man, in order to distinguish him from another, that of *Marchiali* was given to the man with the iron mask: a name which evidently shows, that it had been invented by an Italian. [Cardinal Mazarine was a native of Piscina in the Abruzzo.]

9. Anne of Austria was remarkably delicate respecting every thing that touched her person. It was with great difficulty that cambric could be found fine enough to make shifts and sheets for her. Cardinal Mazarine once rallying her on this subject, said, *That if she should be damned, her punishment in hell would be to sleep in Holland sheets.* The predominant taste of the man with the iron masque, was to have lace and linen of the most extraordinary fineness. "Who (says the author) does not perceive, in this similarity of tastes, the maternal tenderness of Anne of Austria, who would have thought her son a great sufferer had he not been indulged with fine linen?"

"Louis XIII. (continues M. de St Mihiel) was a husband of a gloomy disposition, and an enemy to pleasure: while the queen, on the contrary, was fond of social life; and introduced at the court of France, especially after she became free, that ease and politeness which distinguished it under Louis XIV. from all the other courts of Europe. Louis XIII. had also a disagreeable countenance, and a breath so offensive, that it was a punishment for Richlieu to remain near him. It is clear, therefore, that she could not be much pleased with such a husband. When she became regent of the kingdom by the king's death, which happened on the 14th of May 1643, as she had not enjoyed that happiness which arises from a close union of hearts, it will not appear extraordinary

that she should indulge the affection she entertained for cardinal Mazarine, and that she should marry him. Every circumstance that could tend to favour such a marriage will be found united in her situation. She was at a distance from her family; absolute mistress of all her actions; and had, besides, a heart formed for love. Mazarine, though a cardinal, had never entered into orders; he gave out that he was descended from a great family; he was handsome and well made; he was of a mild, insinuating disposition, and remarkably engaging in conversation; and his office, as prime minister, afforded him every opportunity of visiting and conversing with the queen whenever he thought proper. Is it, therefore, so very astonishing, that, with so many advantages, he was able to captivate the queen so far as to induce her to marry him? Such a marriage was not, indeed, according to the usual course of things. Yet it was not without many precedents, particularly among sovereigns of the other sex, who had given their hands to persons of inferior rank. Thus Christian IV. of Denmark espoused Christina Monck; Frederick IV. espoused Mademoiselle Reventlau; James II. heir to the throne of England, married the daughter of a counsellor; Peter the Great raised to the throne Catharine I. the daughter of a poor villager, yet perhaps the most accomplished woman at that time between the Vistula and the pole; and Louis XIV. espoused the widow of a poet, but a woman possessed of the most extraordinary merit. As the women, however, are not forgiven so readily as the men for entering into such marriages, Anne of Austria kept hers a secret from this motive, and because she would have been in danger of losing the regency of the kingdom had it been known."

The reasoning of M. de St Mihiel is both ingenious and plausible; though the probability of the account is somewhat diminished by considering what must have been the queen's age at this period, after she had been Louis's wife for 29 years before his death.—The account immediately preceding, without this objection, seems abundantly credible. But whether, upon the whole, either of them can be received as decisive, or whether the mystery of the iron mask remains still to be unravelled, we must leave to the reader to determine.

MASQUE, in architecture, is applied to certain pieces of sculpture, representing some hideous forms, grotesque, or satyrs faces, &c. used to fill up and adorn vacant places, as in friezes, the pannels of doors, keys of arches, &c. but particularly in grottos.

MASQUERADE, or **MASCARADE**, an assembly of persons masked or disguised, meeting to dance and divert themselves. This was much in use with us, and has been long a very common practice abroad, especially in carnival time.

The word comes from the Italian *mascarata*, and that from the Arabic *maskara*, which signifies "railery, buffoonery." Granacci, who died in 1543, is said to have been the first inventor of masquerades.

MASRAKITHA, a pneumatic instrument of music among the ancient Hebrews, composed of pipes of various sizes, fitted into a kind of wooden chest, open at the top, and stopped at the bottom with wood covered with a skin. Wind was conveyed to it from the

Maf. the lips, by means of a pipe fixed to the chest: the pipes were of lengths musically proportioned to each other, and the melody was varied at pleasure, by stopping and unstopping with the fingers the apertures at the upper extremity. See Plate CCLXXIX.

MASS, in mechanics, the matter of any body cohering with it, *i. e.* moving and gravitating along with it. In which sense, *mass* is distinguished from bulk, or volume, which is the expansion of a body in length, breadth, and thickness.

The mass of any body is rightly estimated by its weight. And the masses of two bodies of the same weight are in a reciprocal ratio of their bulks.

MASS, *Missæ*, in the church of Rome, the office or prayers used at the celebration of the eucharist; or in other words consecrating the bread and wine into the body and blood of Christ, and offering them so transubstantiated as an expiatory sacrifice for the quick and the dead.

As the mass is in general believed to be a representation of the passion of our blessed Saviour, so every action of the priest, and every particular part of the service, is supposed to allude to the particular circumstances of his passion and death.

Nicod, after Baronius, observes that the word comes from the Hebrew *missach*, (*oblatum*;) or from the Latin *missa missorum*; because in the former times, the catechumens and excommunicated were sent out of the church, when the deacons said, *Ite, missa est*, after sermon and reading of the epistle and gospel; they not being allowed to assist at the consecration. Menagè derives the word from *missio*, "dismissing:" Others from *missa*, "missing, sending;" because in the mass, the prayers of men on earth are sent up to heaven.

The general division of masses consists in high and low. The first is that sung by the choristers, and celebrated with the assistance of a deacon and sub-deacon; low masses are those in which the prayers are barely rehearsed without singing.

There are a great number of different or occasional masses in the Romish church, many of which have nothing peculiar but the name: such are the masses of the saints; that of St Mary of the snow, celebrated on the fifth of August; that of St Margaret, patroness of lying-in women; that of the feast of St John the Baptist, at which are said three masses; that of the Innocents, at which the gloria in excelsis and the hallelujah are omitted, and it being a day of mourning, the altar is of a violet-colour. As to ordinary masses, some are said for the dead, and, as is supposed, contribute to fetch the soul out of purgatory: at these masses the altar is put in mourning, and the only decorations are a cross in the middle of six yellow wax-lights; the dress of the celebrant, and the very mass-book, are black; many parts of the office are omitted, and the people are dismissed without the benediction. If the mass be said for a person distinguished by his rank or virtues, it is followed with a funeral oration; they erect a *chapel ardente*, that is, a representation of the deceased with branches and tapers of yellow wax, either in the middle of the church, or near the deceased's tomb, where the priest pronounces a solemn absolution of the deceased. There are likewise private masses said for stolen or strayed goods or cattle,

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for health, for travellers, &c. which go under the name of *votive masses*. There is still a further distinction of masses denominated from the countries in which they were used; thus the Gothic mass, or *missa mosarabum*, is that used among the Goths when they were masters of Spain, and which is still kept up at Toledo and Salamanca; the Ambrosian mass is that composed by St Ambrose, and used only at Milan, of which city he was bishop; the Gallic mass, used by the ancient Gauls; and the Roman mass, used by almost all the churches in the Romish communion.

Mass of the Presanctified, (*missa presanctificationum*), is a mass peculiar to the Greek church, in which there is no consecration of the elements; but after singing some hymns, they receive the bread and wine which was before consecrated. This mass is performed all Lent, except on Saturdays, Sundays, and the annunciation. The priest counts upon his fingers the days of the ensuing week on which it is to be celebrated, and cuts off as many pieces of bread at the altar as he is to say masses; and after having consecrated them, steep them in wine, and then puts them in a box; out of which, upon every occasion, he takes some of it with a spoon, and putting it on a dish sets it upon the altar.

MASSA, a town of Italy, in the kingdom of Naples, and in the Terra di Lavoro, with a bishop's see; seated on a mountain near the sea, in E. Long. 10. 0. N. Lat. 43. 5.

MASSA, an ancient, populous, and handsome town of Italy, and capital of a small territory of the same name, with the title of a principality, and a strong castle. It is famous for its quarries of fine marble, and is situated in E. Long. 14. 23. N. Lat. 40. 40.

MASSACHUSETTS COLONY, the principal subdivision of New England, having Hampshire on the north, the Atlantic ocean on the east and south, and Connecticut and New York on the west. It is about 100 miles long, and 40 broad. See *New ENGLAND*.

MASSACRE, a term used to signify the sudden and promiscuous butchery of a multitude. The most atrocious example of this kind upon record is that called the *Parisian MASSACRE*, or *Massacre of St Bartholomew's Day*. The Parisian massacre was carried on with such detestable perfidy, and executed with such a bloody cruelty, as would surpass all belief, were it not attested by the most undeniable evidence. In the year 1572, in the reign of Charles IX. many of the principal protestants were invited to Paris, under a solemn oath of safety, upon occasion of the marriage of the king of Navarre with the French king's sister, viz. the king of Navarre's mother, Coligni admiral of France, with other nobles. The queen-dowager of Navarre, a zealous protestant, was poisoned by a pair of gloves before the marriage was solemnized; and on the 24th of August 1572, being Bartholomew's day, about day-break, upon the toll of the bell of the church of St Germain, the butchery began. The admiral was basely murdered in his own house; and then thrown out of the window, to gratify the malice of the duke of Guise: his head was afterwards cut off, and sent to the king and queen-mother; and his body, after a thousand indignities offered to it, hung up by the feet on a gibbet. After this,

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Massacre. the murderers ravaged the whole city of Paris, and butchered in three days above ten thousand lords, gentlemen, presidents, and people of all ranks. An horrible scene of things, says Thuanus, when the very streets and passages resounded with the noise of those that met together for murder and plunder; the groans of those who were dying, and the shrieks of such as were just going to be butchered, were every where heard; the bodies of the slain thrown out of the windows; the courts and chambers of the houses filled with them; the dead bodies of others dragged through the streets, their blood running down the channels in such plenty, that torrents seemed to empty themselves in the neighbouring river: and, in a word, an innumerable multitude of men, women with child, maidens, and children, were all involved in one common destruction; and the gates and entrances of the king's palace all besmeared with their blood.

From the city of Paris the massacre spread almost throughout the whole kingdom. In the city of Meaux they threw above two hundred into jail; and after they had ravished and killed a great number of women, and plundered the houses of the protestants, they executed their fury on those they had imprisoned, and calling them out one by one, they were killed, as Thuanus expresses, like sheep in a market; the bodies of some were flung into ditches, and of others into the river Maine. In Orleans they murdered above five hundred men, women, and children, and enriched themselves with their spoil. The same cruelties were practised at Angers, Troyes, Bourges, La Charité, and especially at Lyons, where they inhumanly destroyed above eight hundred protestants; children hanging on their parents necks; parents embracing their children; putting ropes about the necks of some, dragging them through the streets, and throwing them, mangled, torn, and half-dead, into the river.

It would be endless to mention the butcheries committed at Valence, Romaine, Rouen, &c. We shall, therefore, only add, that, according to Thuanus, above thirty thousand protestants were destroyed in this massacre, or, as others with greater probability affirm, above one hundred thousand.

Thuanus himself calls this a most detestable villainy; and, in abhorrence of St Bartholomew's day, used to repeat these words of P. Statius, *Silv. v. iii. ver. 88. &c.*

Excidet illa dies awo, ne postera credant

Secula. Nos certe taceamus, et obruta multa

Nocte tegi propria patiamus crimina gentis.

In the words of Job, chap. iii. ver. 3. &c. "Let that day perish; and let it not be joined unto the days of the year. Let darkness and the shadow of death stain it," &c. And yet, as though this had been the most heroic transaction, and could have procured immortal glory to the authors of it, medals were struck at Paris in honour of it.

But how was the news of this butchery received at Rome, that faithful city, that holy mother of churches! How did the vicar of Christ, the successor of Peter, and the father of the Christian world, relish it? Let Thuanus tell the horrid truth. When the news, says he, came to Rome, it was wonderful to see how they exulted for joy. On the 6th of September, when the letters of the pope's legate were read in the assembly

of the cardinals, by which he assured the Pope that all was transacted by the express will and command of the king, it was immediately decreed that the pope should march with his cardinals to the church of St Mark, and in the most solemn manner give thanks to God for so great a blessing conferred on the see of Rome and the Christian world; and that on the Monday after, solemn mass should be celebrated in the church of Minerva; at which the pope, Greg. XIII. and cardinals were present; and that a jubilee should be published throughout the whole Christian world, and the cause of it declared to be, to return thanks to God for the extirpation of the enemies of the truth and church in France. In the evening the cannon of St Angelo were fired, to testify the public joy; the whole city illuminated with bonfires; and no one sign of rejoicing omitted that was usually made for the greatest victories obtained in favour of the Roman church.

MASSAGETAE, an ancient people about whose seat there is as much doubt as about that of the Amazons: Tibullus and Ammian place them near Albania, beyond the Araxes, which sometimes denotes the Oxus; it is probable they dwelt to the east of Sogdiana, (Dionysius Periegetes, Herodotus, Arrian).

MASSALIANS, a set of enthusiasts who sprang up about the year 361, in the reign of the emperor Constantius, who maintained that men have two souls, a celestial and a diabolical, and that the latter is driven out by prayer.

MASSANIELLO, see *History of Naples*.

MASSETER, in anatomy. See there, (*Table of the Muscles*).

MASSICOT, see **MASTICOT**.

MASSIEU (William), a learned French writer, member of the academy of belles lettres, and of the French academy, was born at Caen in Normandy in 1665, and completed his studies at Paris, when he entered amongst the Jesuits; but afterwards left them, that he might follow his inclination to polite literature with the greater freedom. In 1710 he was made Greek professor in the royal college; and enjoyed that post till his death, which happened at Paris in 1722. He wrote, 1. Several curious dissertations in the memoirs of the academy of inscriptions. 2. A history of the French poetry, in 12mo, &c.

MASSILIA, (anc. geog.) a town of Gallia Narbonensis, a colony of Phoceans, from Phocæa, a city of Ionia, and in confederacy with the Romans; universally celebrated, not only for its port, commerce, and strength, but especially for its politeness of manners and for its learning. According to Strabo, it was the school for barbarians, who were excited by its means to a fondness for Greek literature, so that even their public and private transactions were all executed in that language. Strabo adds, "At this day the noblest Romans repair thither for study rather than to Athens." Now **MARSEILLES**, a city and port-town of Provence.

MASSILLON (Jean Baptiste), son of a notary at Hieres in Provence, was born in 1663, and entered into the congregation of the oratory in 1681. He gained the affections of every person in the towns to which he was sent, by the charms of his genius, the liveliness of his character, and by a fund of the most delicate

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Massillon. delicate and affecting politeness. His first attempts in the art of eloquence were made at Vienne, while he was professor of theology. His funeral oration on Henry de Villars, archbishop of that city, received universal approbation. This success induced Father de la Tour, who was at that time general of the congregation, to call him to Paris. After he had been there for some time, he was asked what he thought of the preachers who made a figure on that great theatre?—"I find them possessed of great genius and abilities (answered he); but if I preach, I will not preach like them." He in fact kept his word, and struck out a new path in this great field of eloquence. P. Bourdaloue was excepted from the number of those whom he proposed not to imitate. If he did not take him for a model in every thing, the reason was, that his genius led him to a different species of eloquence.—His manner of composing, therefore, was peculiar to himself, and, in the opinion of men of taste and judgment, was superior to that of Bourdaloue. The affecting and natural simplicity of the father of the oratory, (said a great man), appear fitter to bring home the truths of Christianity to the heart than all the dialectics of the Jesuit. We must seek for the logic of the gospel in our own breasts; and the most powerful reasonings on the indispensable duty of relieving the distressed, will make no impression on that man who has beheld without concern the sufferings of his brother. If logic is necessary, it is only in matters of opinion; and these are fitter for the press than for the pulpit, which ought not to be the theatre of learned discussions. The truth of these reflections was clearly perceived when he appeared at court. Upon preaching his first advent sermon at Versailles, he received this eulogium from the mouth of Louis XIV. "Father, when I hear others preach, I am very well pleased with them; but whenever I hear you, I am dissatisfied with myself." The first time he preached his famous sermon *on the small number of the elect*, the whole audience were, at a certain place of it, seized with a sudden and violent emotion, and almost every person half rose from his seat by a kind of involuntary movement. The murmur of acclamation and surprise was so great, that it threw the orator into confusion; but this only heightened the impression of that pathetic discourse. What was most surprising in Massillon, was his descriptions of the world, which were so sublime, so delicate, and so striking in the resemblance. When he was asked whence a man, like him, whose life was dedicated to retirement, could borrow them? he answered, "From the human heart; however little we examine it, we will find in it the seeds of every passion. When I compose a sermon (added he), I imagine myself consulted upon some doubtful piece of business. I give my whole application to determine the person who has recourse to me, to act the good and proper part. I exhort him, I urge him, and I leave him not till he has yielded to my persuasions." His declamation did not fail to be accompanied with success. "We think we see him in our pulpits (say those who had the pleasure of hearing him), with the simple air, the modest carriage, the down-cast and humble looks, the easy gesture, the affecting tone, and the countenance of a man deeply penetrated with his subject, conveying the clearest information to the

understanding, and raising the most tender emotions in the heart." Baron, the famous comedian, having met him one day in a house which was open for the reception of men of letters, paid him this compliment: "Continue to deliver as you do. Your manner is peculiar to yourself; leave the observance of rules to others." When this famous actor came from hearing one of his sermons, truth drew from him the following confession, which is so humiliating to his profession: "Friend (said he to one of his companions who accompanied him), here is an orator; we are only actors."

In 1704 Massillon made his second appearance at court, and displayed still more eloquence than before. Louis XIV. after expressing his satisfaction to him, added, in the most gracious tone of voice, *Et je veux, mon pere, vous entendre tous les deux ans.* These flattering encomiums did not lessen his modesty. When one of his fellows was congratulating him upon his preaching admirably, according to custom, "Oh! give over, Father (replied he), the devil has told me so already, much more eloquently than you." The duties of his office did not prevent him from enjoying society; and in the country he forgot that he was a preacher, but always without trespassing against decency. One day when he was at the house of M. de Crozat, the latter said to him, "Father, your doctrine terrifies me, but I am encouraged by your life." He was chosen, on account of his philosophical and conciliatory disposition of mind, to reconcile the cardinal de Noailles with the Jesuits. All he gained by his attempts was the displeasure of both parties; and he found that it was easier to convert sinners than to reconcile theologians. In 1717, the regent, personally acquainted with his merit, appointed him to the bishopric of Clermont. The next year, being destined to preach before Louis XV. who was only nine years of age, he composed in six weeks those discourses which are so well known by the name of *Petit Carême*. These are the chef d'œuvre of this orator, and indeed of the oratorical art. They ought continually to be read by preachers as models for the formation of their taste, and by princes as lessons of humanity.

Massillon was admitted into the French academy a year afterwards, in 1719. The abbacy of Savigny becoming vacant, the cardinal du Bois, to whom he had been weak enough to give an attestation for being a priest, procured it for him. The funeral oration of the duchess of Orleans, in 1723, was the last discourse he pronounced in Paris. He never afterwards left his diocese, where his gentleness, politeness, and kindness, had gained him the affection of all who knew him. He reduced the exorbitant rights of the episcopal roll to moderate sums. In two years, he caused 20,000 livres to be privately conveyed to the Hotel-Dieu of Clermont. His peaceable disposition was never more displayed than while he was a bishop. He took great pleasure in collecting the fathers of the oratory and the Jesuits at his country-house, and in making them join in some diversion. He died on the 28th of September 1742, at the age of 79. His name has become that of eloquence itself. Nobody ever knew better how to touch the passions. Preferring sentiment to every thing else, he communicated to the soul that lively and salutary emotion which ex-

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cites in us the love of virtue. What pathetic eloquence did his discourses display! what knowledge of the human heart! what constant disclosing of a mind deeply affected with his subject! what strain of truth, philosophy, and humanity! what imagination, at once the most lively, and guided by the soundest judgment! Just and delicate thoughts; splendid and lofty ideas; elegant, well chosen, sublime, and harmonious expressions; brilliant and natural images; true and lively colouring; a clear, neat, swelling, and copious style, equally suited to the capacity of the multitude, and fitted to please the man of genius, the philosopher, and the courtier, form the character of Maffillon's eloquence, especially in his *Petit Carême*. He could at once think, describe, and feel. It has been justly observed concerning him, that he was to Bourdaloue what Racine was to Corneille. To give the finishing stroke to his eulogium, Of all the French orators, he is the most esteemed by foreigners.

An excellent edition of Maffillon's works was published by his nephew at Paris in 1745 and 1746, in 14 vols. large 12mo, and 12 vols. of a small size.— Among them we find, 1. Complete sets of Sermons for Advent and Lent. It is particularly in his moral discourses, such as are almost all those of his sermons for Advent and Lent, that Maffillon's genius appears. He excels, says M. d'Alembert, in that species of eloquence, which alone may be preferred to all others, which goes directly to the heart, and which agitates without wounding the soul. He searches the inmost recesses of the heart, and lays open the secret workings of the passions, with so delicate and tender a hand, that we are hurried along rather than overcome. His diction, which is always easy, elegant, and pure, every where partakes of that noble simplicity, without which there can be neither good taste nor true eloquence; and this simplicity is, in Maffillon, joined to the most attractive and the sweetest harmony, from which it likewise borrows new graces. In short, to complete the charm produced by this enchanting style, we perceive that these beauties are perfectly natural; that they flow easily from this source, and that they have occasioned no labour to the composer. There even occur sometimes in the expressions, in the turns, or in the affecting melody of his style, instances of negligence which may be called happy, because they completely remove every appearance of labour. By thus abandoning himself to the natural current of thought and expression, Maffillon gained as many friends as hearers. He knew, that the more anxious an orator appears to raise admiration, he will find those who hear him the less disposed to bestow it. 2. Several Funeral Orations, Discourses, and Panegyrics, which had never been published. 3. Ten discourses, known by the name of *Petit Carême*. 4. The *Conferences ecclésiastiques*, which he delivered in the seminary of St Magloire upon his arrival at Paris; those which he delivered to the curates of his diocese; and the discourses which he pronounced at the head of the synods which he assembled every year. 5. Paraphrases on several of the Psalms. The illustrious author of these excellent tracts wished that they had introduced into France a practice which prevails in England, of reading sermons instead of preaching them from me-

mory; a custom which is very convenient, but by which all the warmth and fervour of eloquence are lost. He, as well as two others of his brethren, had stopt short in the pulpit exactly on the same day.— They were all to preach at different hours on Good-Friday, and they went to hear one another in succession. The memory of the first failed, which so terrified the other two, that they experienced the same fate. When our illustrious orator was asked, what was his best sermon? he answered, "That which I am most master of." The same reply is ascribed to Bourdaloue. The celebrated P. la Rue was of the opinion of Maffillon, that getting by heart was a slavery which deprived the pulpit of a great many orators, and which was attended with many inconveniencies to those who dedicated themselves to it. The Abbé de la Porte has collected into 1 vol. 12mo the most striking ideas, and the most sublime strokes, which occur in the works of the celebrated bishop of Clermont. This collection, which is made with great judgment, appeared at Paris in 1748, 12mo, and forms the 15th volume of the large edition in 12mo, and the 13th of the small in 12mo. It is entitled, *Pensées sur differens sujets de morale et de pieté, tirées, &c.*

MASSINGER (Philip), an English dramatic poet, was born at Salisbury about the year 1581, and was educated at Oxford. He left the university without taking any degree; and went to London to improve his poetical genius by polite conversation. There he wrote many tragedies and comedies, which were received with vast applause; and were greatly admired for the economy of the plots and the purity of the style. He was at the same time a person of the most consummate modesty: which rendered him extremely beloved by the poets of his time, particularly by Fletcher, Middleton, Rowley, Field, and Decker, who thought it an honour to write in conjunction with him. He was as remarkable for his abilities as his modesty. He died suddenly at his house on the Bank-side in Southwark, near the play-house; and was interred in St Saviour's church-yard, in the same grave with Mr Fletcher the poet.

MASSIVE, among builders, an epithet given to whatever is too heavy and solid: thus a massive column is one too short and thick for the order whose capital it bears; and a massive wall is one whose openings or lights are too small in proportion.

MASSON (Papius), a French writer, was the son of a rich merchant, and born in the territory of Forez, May 1544. After studying the belles lettres and philosophy, and travelling to different places, he came to Paris, where he was made librarian to the chancellor of the duke of Anjou, in which place he continued ten years. In 1576, he was made an advocate of parliament; yet never pleaded but one cause, which, however, he gained with universal applause.— When the troubles of France were at an end, he married the sister of a counsellor in parliament, with whom he lived thirty-four years, but had no issue by her.— The infirmities of age attacked him some time before his death, which happened Jan. 9. 1611. He wrote four books of French annals in Latin, first printed at Paris 1577, and afterwards in 1598, 4to. The second edition, more enlarged than the first, deduces things

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things from Pharamond to Henry II. Masson considered this as his principal performance; yet he is now chiefly known by his *Elogia virorum clarissimorum*, although he published several other works.

MASSON (John), a reformed minister in Holland some years ago. He was originally of France, but fled into England to enjoy that liberty in religion which his country refused him. He wrote, 1. *Histoire critique de la republique des lettres*, from 1712 to 1717, in 15 vols. 12mo. 2. *Vite Horatii, Ovidii, et Plinii junioris*, 3 vols small 8vo, and printed abroad, though dedicated to Englishmen of rank: the first at Leyden, 1708, to lord Harvey; the second at Amsterdam, 1708, to Sir Justinian Isham; the third at Amsterdam, 1709, to the bishop of Worcester. These lives are drawn up in a chronological order, very learnedly and very critically; and serve to illustrate the history, not only of those particular persons, but of the times also in which they lived. 3. *Histoire de Pierre Bayle & de ses ouvrages*; Amsterdam, 1716, in 12mo. This at least is supposed to be his, though at first it was given to M. la Monnoye.

MASSON (Anthony), an eminent French engraver, who flourished towards the conclusion of the last century, and resided chiefly at Paris. It appears that he sometimes amused himself with painting portraits from the life, some of which he also engraved. We have no account of the life of this extraordinary artist; nor are we even informed from what master he learned the principles of engraving. He worked entirely with the graver, and handled that instrument with astonishing facility. He seems to have had no kind of rule to direct him with respect to the turning of the strokes; but twisted and torted them about, without the least regard to the different forms he intended to express, making them entirely subservient to his own caprice. Yet the effect he has produced in this singular manner (Mr Strutt observes), is not only far superior to what one could have supposed, but is often very picturesque and beautiful. It was not in historical engraving that his greatest strength consisted. He could not draw the naked parts of the human figure so correctly as was necessary; but where the subject required the figures to be clothed, he succeeded in a wonderful manner. Among the most esteemed works by this admirable artist, may be reckoned the following: The assumption of the Virgin, a large upright plate from Rubens; a holy family, a middling-sized plate, lengthwise, from N. Mignard; Christ with the pilgrims at Emaus, a large plate, lengthwise, from Titian, the original picture of which is in the cabinet of the king of France. This admirable print is commonly known by the name of *the table-cloth*; for the cloth, with which the table is covered, is executed in a very singular style. Also the following portraits, among others: The comte de Harcourt, a large upright plate, reckoned a masterpiece in this class of subjects; Guillaume de Brisacier, secretary to the queen of France; a middling-sized upright plate: usually known in England by the name of *the Grey-headed Man*, because the hair in this print is so finely executed.

MASSUAH, a small island in the Red Sea, near the coast of Abyssinia, about three quarters of a mile long, and half as broad, one-third of which is occu-

pied by houses, another by cisterns for receiving rain-water, and one reserved for a burial place. It has an excellent harbour, with water sufficiently deep for ships of any size to the very edge of the island; and so well secured, that they may ride in safety, let the wind blow from what quarter or with what degree of strength it will. By the ancients it was called *Sebasticum Os*, and was formerly a place of great consequence on account of its harbour, from whence a very extensive commerce was carried on, and possessed a share of the Indian trade in common with other ports of the Red Sea near the Indian Ocean.—A very considerable quantity of valuable goods was also brought thither from the tract of mountainous country behind it, which in all ages has been accounted very inhospitable, and almost inaccessible to strangers. The principal articles of exportation were gold, ivory, elephants, and buffaloes hides; but above all slaves, who, on account of their personal qualifications, were more esteemed than those from any other quarter.—Pearls of a considerable size, and of a fine water, are likewise found along the coast; from the abundance of all which valuable commodities, the great defect, a want of water, was forgot, and the inhabitants cheerfully submitted to such a great inconvenience. The island of Massuah fell under the power of the Turks in the time of the emperor Selim, soon after the conquest of Arabia Felix by Sinan Basha, and was for some time governed by an officer from Constantinople. From thence the conquest of Abyssinia was for some time attempted, but always without success. Hence it began to lose its value as a garrison for troops, as it had done in the commercial way after the discovery of the passage to India by the Cape of Good Hope.—Being thus deprived of its importance in every respect, the Turks no longer thought it worth while to send a bashaw thither as formerly, but conferred the government upon the chief of a tribe of Mahometans named *Belowie*, who inhabit the coasts of the Red Sea under the mountains of Habab, in the latitude of about 14° north. On this officer they conferred the title of *Naybe*; and on the removal of the bashaw, he remained in fact master of the place, though, to save appearances, he pretended to hold it from the Ottoman Porte, by a firman from the Grand Signior for that purpose, and the payment of an annual tribute.

The Turks had originally put into the town of Massuah a garrison of Janizaries; who, being left there on the withdrawing of the bashaw, and intermarrying with the natives, soon became entirely subjected to the Naybe's influence. The latter, finding himself at a great distance from his protectors the Turks, whose garrisons were every where falling into decay, and that in consequence of this he was entirely in the power of the emperor of Abyssinia, began to think of taking some method of securing himself on that side. Accordingly it was agreed that one half of the customs should be paid to the Abyssinian monarch; who in return was to allow him to enjoy his government unmolested. Having thus secured the friendship of the emperor of Abyssinia, the Naybe began gradually to withdraw the tribute he had been accustomed to pay to the bashaw of Jidda, to whose government Massuah had been assigned; and at last to pay as little regard to the government of Abyssinia: and in this state of

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independence he was when Mr Bruce arrived there in 1769 on his way to Abyssinia. This gentleman found both the prince and his people extremely inhospitable and treacherous; so that he underwent a variety of dangers during his residence there, nor was it without great difficulty that he could get away from thence at last.

The island of Massuah, as we have said, is entirely destitute of water; nor can it be supplied with provisions of any kind but from the mountainous country of Abyssinia on the continent. Arkeeko, a large town in the bottom of the bay, has water, but is in the same predicament with regard to provisions; for the adjacent tract of flat land, named *Sambar*, is a perfect desert, inhabited only from the month of November to April by some wandering tribes, who carry all their cattle to the Abyssinian side of the mountains when the rains fall there. Being thus in the territories of the Abyssinians, it is in the power of the emperor of that country, or of his officer the Baharnagash, to starve Massuah and Arkeeko, by prohibiting the passage of any provisions from the Abyssinian side of the mountains.

The houses of Massuah are generally constructed of long poles and bent grass, as is usual with other towns of Arabia: only about 20 are of stone, and six or eight of these two stories high. The stones with which they are built have been drawn out of the sea; and in them the bed of that curious muscle found embodied in the solid rock at Mahon is frequently to be seen. These are called *dattoli da mare*, or sea-dates: but our author never saw any of the fish themselves, though he has no doubt that they may be met with in the rocky islands of Massuah if they would take the trouble of breaking the rocks for them. All the necessities of life are very dear in this place; and their quality is also very indifferent, owing to the distance from whence they must be brought, and the danger of carrying them through the desert of Samhar, as well as to the extortions of the Naybe himself, who, under the name of *customs*, takes whatever part of the goods he thinks proper; so the profit left to the merchant is sometimes little or nothing. All the money here is valued by the Venetian sequin; and it is owing to the commercial intercourse with the Arabian coast that any money at all is to be met with on this island or the eastern coast of Africa. Glass beads of all kinds and colours, whether whole or broken, pass for small money.

Though Massuah has now lost very much of its commercial importance, a considerable trade is still carried on from the place. From the Arabian side are imported blue cotton and other cloths; some of them from India being very fine. Other articles are Venetian beads, crystal, looking and drinking glasses, with cohol or crude antimony. These three last articles come in great quantity from Cairo, first in the coffee-ships to Jidda, and then in small barks to the port of Massuah. Old copper is also a valuable article of commerce. The Galla and all the various tribes to the westward of Gondar wear bracelets of this metal, which in some parts of that barbarous country is said to sell for its weight of gold. Here is also a shell, an univalve of the species of volutes, which sells at an high price, and passes for money among the various

tribes of Galla. The Banians were once the principal merchants of Massuah; but their number is now reduced to six, who are silver-smiths, and subsist by making ornaments for the women on the continent. They likewise essay gold, but make a poor livelihood.

MASSUET (Rene, or Renatus), a very learned Benedictine of the congregation of St Maur, was born at S. Owen de Macelles, in 1665. He is chiefly known for the new edition of St Irenæus, which he published in 1710. He consulted several manuscripts, which had never been examined, for that purpose, and made new notes and learned prefaces. He died in 1716, after having written and published several other works.

MAST, a long round piece of timber, elevated perpendicularly upon the keel of a ship, to which are attached the yards, the sails, and the rigging. A mast, with regard to its length, is either formed of one single piece, which is called a *pole-mast*, or composed of several pieces joined together, each of which retains the name of mast separately. The lowest of these is accordingly named the *lower-mast*, *a*, fig. 1. the next in height is the *top-mast*, *b*, which is erected at the head of the former; and the highest is the *top-gallant mast*, *c*, which is prolonged from the upper end of the top-mast. Thus the two last are no other than a continuation of the first upwards.

The lower-mast is fixed in the ship by an apparatus, described in the articles *HULK* and *SHEERS*: the foot, or heel of it, rests in a block of timber called the *step*, which is fixed upon the *kelson*: and the top-mast is attached to the head of it by the *cap* and the *treble-trees*. The latter of these are two strong bars of timber, supported by two prominences, which are as shoulders on the opposite sides of the mast, a little under its upper end: athwart these bars are fixed the *cross-trees*, upon which the frame of the top is supported. Between the lower-mast-head and the foremost of the cross-trees, a square space remains vacant, the sides of which are bounded by the two treble-trees. Perpendicularly above this is the foremost hole in the cap, whose after-hole is solidly fixed on the head of the lower-mast. The top-mast is erected by a tackle, whose effort is communicated from the head of the lower-mast to the foot of the top-mast; and the upper end of the latter is accordingly guided into and conveyed up through the holes between the treble-trees and the cap, as above-mentioned. The machinery by which it is elevated, or, according to the sea-phrase, *swayed up*, is fixed in the following manner: the top rope *d*, fig. 3. passing through a block *e*, which is hooked on one side of the cap, and afterwards through a hole, furnished with a sheave or pulley *f*, on the lower end of the top-mast, is again brought upwards on the other side of the mast, where it is at length fastened to an eye bolt in the cap *g*, which is always on the side opposite to the top-block *e*. To the lower end of the top-rope is fixed the top-tackle *h*, the effort of which being transmitted to the top-rope *d*, and thence to the heel of the top-mast *f*, necessarily lifts the latter upwards, parallel to the lower-mast. When the top-mast is raised to its proper height, fig. 4. the lower end of it becomes firmly wedged in the square hole above described, between the treble-trees. A bar of wood or iron called the *fid*, is then thrust through a hole *i* in the heel of it,

Massuet, Mast.

Plate CCLXXXI

MAST.

Fig. 5.

Fig. 6.

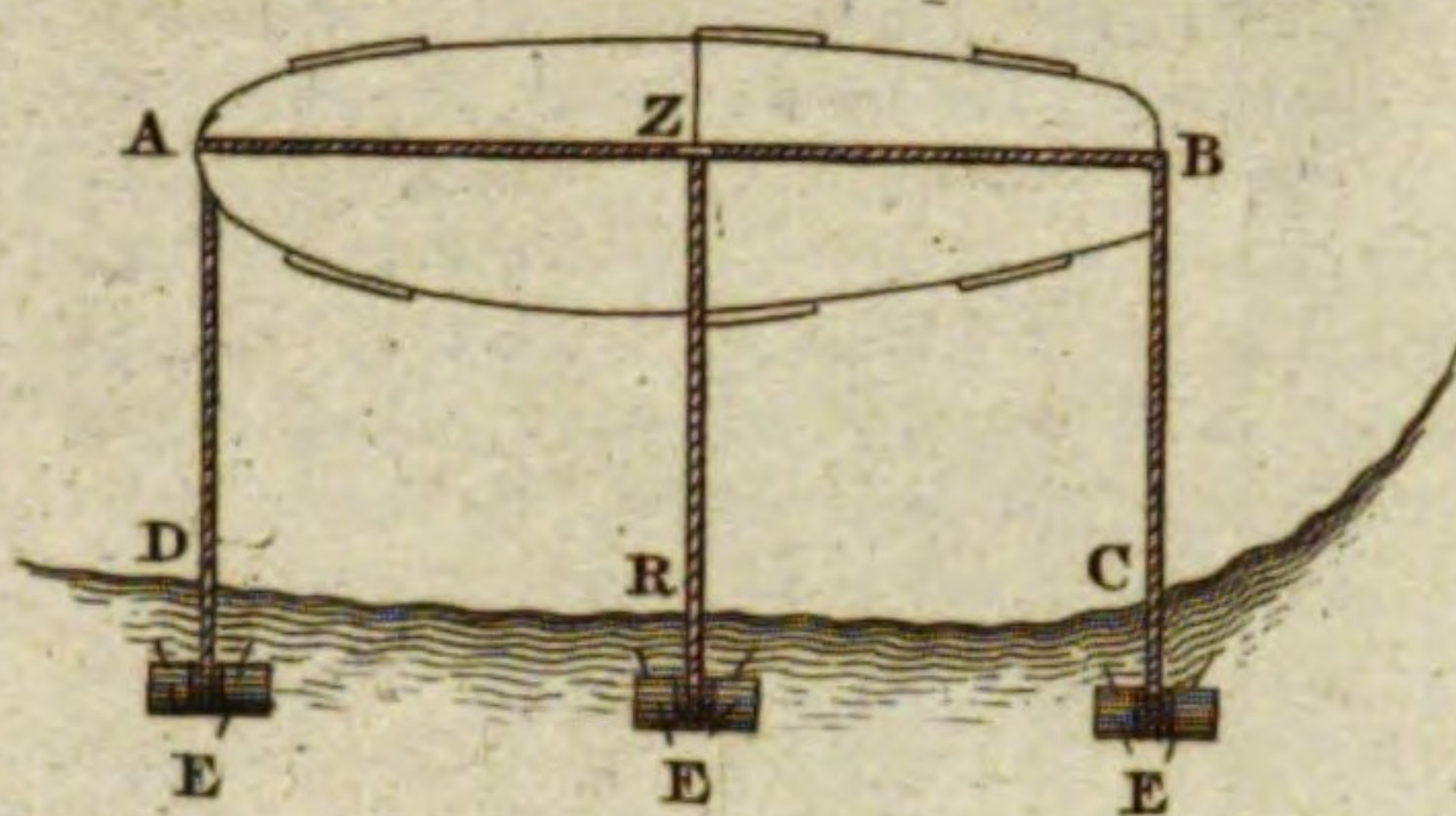
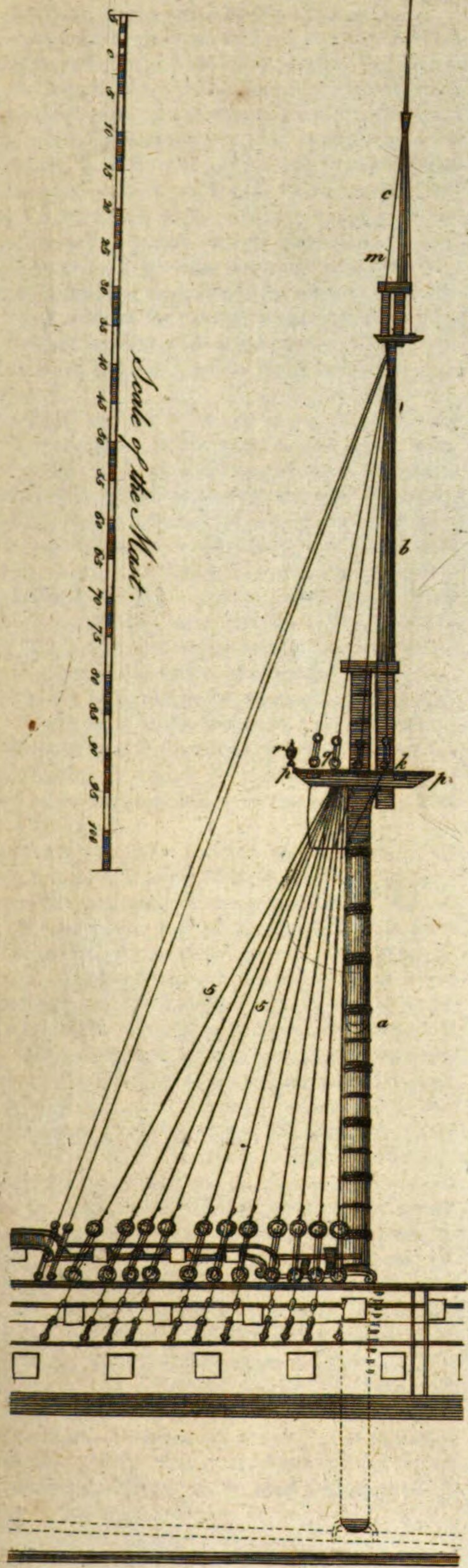


Fig. 4.

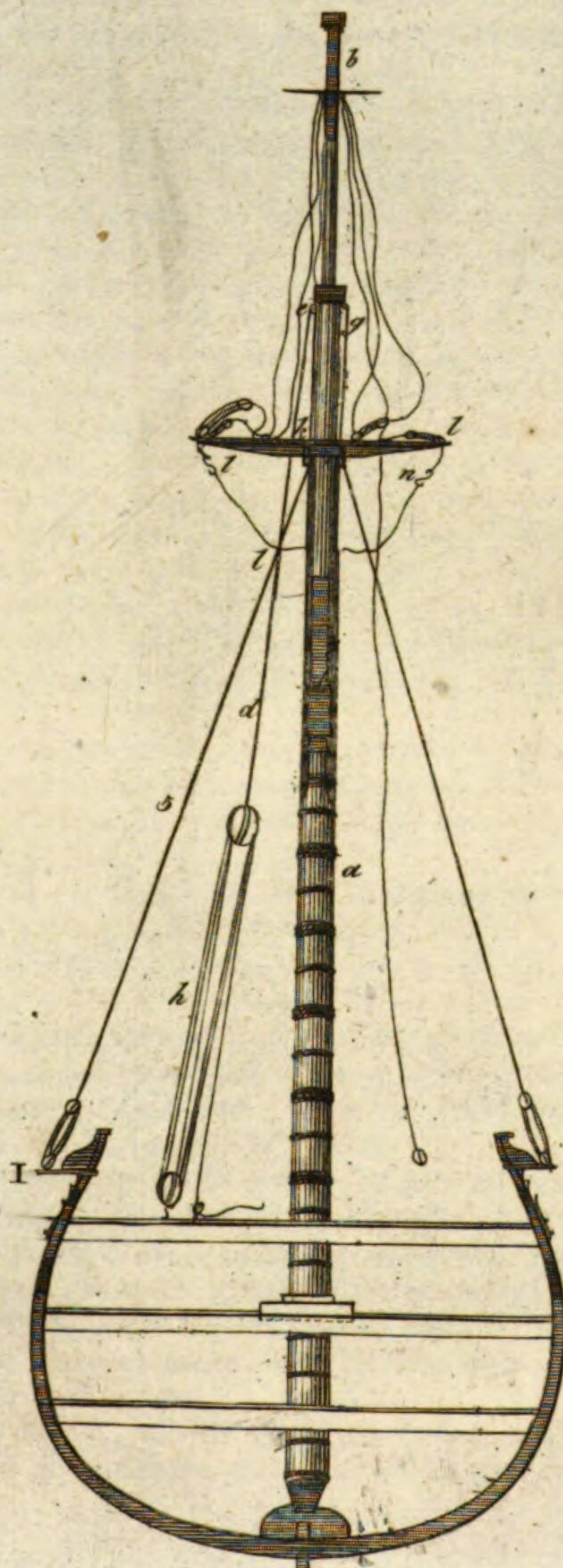


Fig. 1.



1771

1772



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Mast. it, across the tressle-trees, by which the whole weight of the top-mast is supported.

In the same manner as the top-mast is retained at the head of the lower-mast, the top-gallant-mast is erected, and fixed at the head of the top-mast.

Plate
CCLXXXI

Besides the parts already mentioned in the construction of masts, with respect to their length, the lower-masts of the largest ships are composed of several pieces united into one body. As these are generally the most substantial parts of various trees, a mast, formed by this assemblage, is justly esteemed much stronger than one consisting of any single trunk, whose internal solidity may be very uncertain. The several pieces are formed and joined together, as represented in the section of a lower-mast of this sort, fig. 5. where *a* is the shaft, or principal piece into which the rest are fixed, with their sides or faces close to each other. The whole is secured by several strong hoops of iron, driven on the outside of the mast, where they remain at proper distances.

The principal articles to be considered in equipping a ship with masts are, 1st, the number; 2d, their situation in the vessel; and, 3d, their height above the water.

The masts being used to extend the sails by means of their yards, it is evident, that if their number were multiplied beyond what is necessary, the yards must be extremely short, that they may not entangle each other in working the ship, and by consequence their sails will be very narrow, and receive a small portion of wind. If, on the contrary, there is not a sufficient number of masts in the vessel, the yards will be too large and heavy, so as not to be managed without difficulty. There is a mean between these extremes, which experience and the general practice of the sea have determined; by which it appears, that in large ships every advantage of sailing is retained by three masts and a bowsprit.

The most advantageous position of the masts is undoubtedly that from whence there results an equilibrium between the resistance of the water on the body of the ship on one part, and of the direction of their effort on the other. By every other position this equilibrium is destroyed, and the greatest effort of the masts will operate to turn the ship horizontally about its direction; a circumstance which retards her velocity. It is counterbalanced indeed by the helm; but the same inconvenience still continues; for the force of the wind, having the resistance of the helm to overcome, is not entirely employed to push the vessel forward. The axis of the resistance of the water should then be previously determined, to discover the place of the *main-mast*, in order to suspend the efforts of the water equally, and place the other masts so as that their particular direction will coincide with that of the main-mast. The whole of this would be capable of a solution if the figure of the vessel were regular, because the point, about which the resistance of the water would be in equilibrio, might be discovered by calculation.

But when the real figure of the ship is considered, these flattering ideas will instantly vanish. This observation induced M. Saverien to employ a mechanical method to discover the axis of resistance of the water, which he apprehended might be used with success in the manner following:

When the vessel is launched, before the places of the masts are determined, extend a rope AB, fig. 6. from the head to the stern. To the extremities A and B attach two other ropes, AD, BC, and apply to the other ends of these ropes two mechanical powers, to draw the ship according to the direction BC, parallel to itself. The whole being thus disposed, let a moveable tube Z, fixed upon the rope AB, have another rope ZR attached to it, whose other end communicates with a mechanical power R, equal to the two powers D and C. This last being applied to the same vessel, in such manner as to take off the effects of the two others by sliding upon the rope AB, so as to discover some point Z, by the parallelism of the ropes AD, BC feebly extended with the rope ZR; the line ZR will be the axis of the equilibrium of the water's resistance, and by consequence the main-mast should be planted in the point Z.

The figures E, E, E, are three windlasses on the shore, by which this experiment is applied.

With regard to the situation of the other masts, it is necessary, in the same manner, to discover two points; so that the direction of the two mechanical powers operating, will be parallel to the axis of resistance RZ already found.

The exact height of the masts, in proportion to the form and size of the ship, remains yet a problem to be determined. The more the masts are elevated above the centre of gravity, the greater will be the surface of sail which they are enabled to present to the wind; so far an additional height seems to have been advantageous. But this advantage is diminished by the circular movement of the mast, which operates to make the vessel stoop to its effort; and this inclination is increased in proportion to the additional height of the mast, an inconvenience which it is necessary to guard against. Thus what is gained upon one hand is lost upon the other. To reconcile these differences, it is certain, that the height of the mast ought to be determined by the inclination of the vessel, and that the point of her greatest inclination should be the term of this height above the centre of gravity. See the article TRIM.

With regard to the general practice of determining the height of the masts, according to the different rates of the ships in the royal navy, the reader is referred to the article SAIL.

In order to secure the masts, and counterbalance the strain they receive from the effort of the sails impressed by the wind, and the agitation of the ship at sea, they are sustained by several strong ropes, extended from their upper ends to the outside of the vessel, called *shrouds*, as represented in fig. 4. They are further supported by other ropes, stretched from their heads towards the fore-part of the vessel.

The mast, which is placed at the middle of the ship's length, is called the *main-mast*; that which is placed in the forepart, the *fore-mast*; and that which is towards the stern, is termed the *mizen-mast*.

N. B. *Mizen* is applied to this mast by all the nations of Europe, except the French, who alone call the fore-mast *mizaine*.

MASTER, a title given to several officers and persons of authority and command; particularly to the

Mast,
Master.

Plate

CCLXXXI

Master.

the chiefs of the orders of knighthood, &c.—Thus we say the grand-master of Malta; of St Lazarus; of the golden fleece; of the free-masons, &c.

MASTER (*magister*), was a title frequent among the Romans: they had their master of the people, *magister populi*, who was the dictator. Master of the cavalry, *magister equitum*, who held the second post in an army after the dictator. Under the later emperors there were also masters of the infantry, *magistri peditum*. A master of the census, *magister census*, who had nothing of the charge of a censor, or subcensor, as the name seems to intimate; but was the same with the *præpositus frumentariorum*.

MASTER of the Militia (*magister militie*), was an officer in the lower empire, created, as it is said, by Dioclesian, who had the inspection and government of all the forces, with power to punish, &c. somewhat like a constable of France. At first there were two of these officers instituted, the one for the infantry, and the other for the cavalry; but the two were united into one under Constantine. Afterwards, as their power was increased, so was their number also; and there was one appointed for the court, another for Thrace, another for the East, and another for Illyria. They were afterwards called *comites*, *counts*, and *clarissimi*. Their power was only a branch of that of the *præfectus prætorii*, who by that means became a civil officer.

MASTER of Arms (*magister armorum*), was an officer or comptroller under the master of the militia.

MASTER of the Offices (*magister officiorum*), had the superintendence of all the officers of the court: he was also called *magister officii palatini*; simply *magister*; and his post *magisteria*.—This officer was the same in the western empire with the *curopalates* in the eastern.

MASTER at Arms, among us, is an officer appointed to teach the officers and crew of a ship of war the exercise of small arms; to confine and plant centinels over the prisoners, and superintend whatever relates to them during their confinement. He is also to observe that the fire and lights are all extinguished as soon as the evening-gun is fired, except those which are permitted by proper authority, or under the inspection of centinels. It is likewise his duty to attend the gangway when any boats arrive aboard, and search them carefully, together with their rowers, that no spirituous liquors may be conveyed into the ship unless by permission of the commanding officer. In these several duties he is assisted by proper attendants, called his *corporals*, who also relieve the centinels and one another at certain periods.

MASTER of Arts, the first degree taken up in foreign universities, but the second in ours; candidates not being admitted to it till they have studied in the university seven years.

MASTER-Attendant, is an officer in the royal dockyards, appointed to hasten and assist at the fitting out or dismantling, removing, or securing vessels of war, &c. at the port where he resides. He is particularly to observe, that his majesty's ships are securely moored, and for this purpose he is expected frequently to review the moorings which are sunk in the harbour, and observe that they are kept in proper repair. It is also his duty to visit all the ships in ordinary, and see that they are frequently cleaned and kept in or-

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der; and to attend at the general musters in the dockyards, taking care that all the officers, artificers, and labourers, registered at the navy-books, are present at their duty.

MASTER of the Ceremonies, is an officer instituted by King James I. for the more solemn and honourable reception of ambassadors, and strangers of quality, whom he introduces into the presence.—The badge of this office is a gold chain and medal, having on one side an emblem of peace, with King James's motto; and on the reverse the emblem of war, with *Dieu & mon droit*. He is always supposed to be a person of good address, and a master of languages, and has an appointment of 300 l. a year: he is constantly attending at court, and hath under him an assistant-master, or deputy, at 6s. 8d. a day, who holds his place during the king's pleasure.

There is also a third officer, called *marshal of the ceremonies*, with 100 l. a-year, whose business is to receive and distribute the master's orders, or the deputy's, for the service; but without their order he can do nothing. This is the king's gift.

MASTERS of Chancery are usually chosen out of the barristers of the common law; and sit in chancery, or at the rolls, as assistants to the lord chancellor and the master of the rolls. All these, so late as the reign of Queen Elizabeth, were commonly doctors of the civil law.—To them are also committed interlocutory reports, examination of bills in chancery, stating of accounts, taxing costs, &c. and sometimes, by way of reference, they are empowered to make a final determination of causes.

They have time out of mind had the honour to sit in the lords house, though they have neither writs nor patent to empower them; but they are received as assistants to the lord chancellor and master of the rolls. They had anciently the care of inspecting all writs of summons, which is now performed by the clerk of the petty-bag. When any message is sent from the lords to the commons, it is carried by the masters of chancery. Before them also affidavits are made, and deeds and recognizances acknowledged.

Besides these, who may be called *masters of chancery ordinary* (being 12 in number, whereof the master of the rolls is reputed the chief), there are also masters of chancery extraordinary, appointed to act in the several counties of England beyond 10 miles distance from London, by taking affidavits, recognizances, &c. for the ease of the suitors of the court.

MASTER of the Faculties, an officer under the archbishop of Canterbury, who grants licences and dispensations: he is mentioned in the statute 22 and 23 Car. II. See *Court of Faculties*.

MASTER-Gunner. See GUNNER.

MASTER of the Horse is reckoned the third great officer of the court, and is an office of great honour and antiquity, and always (when not put in commission) filled by noblemen of the highest rank and abilities. He has the management and disposal of all the king's stables and bred horses. He has authority over the equerries and pages, coachmen, footmen, grooms, riders of the great horse, farriers, and smiths. He appoints all the other tradesmen who work for the king's stables; and by his warrant to the avenor, makes them give an oath to be true and faithful. In short, he is en-

Master.

Master. entrusted with all the lands and revenues appropriated for the king's breed of horses, the expences of the stable, and of the coaches, litters, &c. He alone has the privilege of making use of any of the king's horses, pages, footmen, &c.; and at any solemn cavalcade he rides next the king, and leads a horse of state. His salary is L. 1276 : 13 : 4 *per annum*. There is also a master of the horse in the establishment of her majesty's household, with a salary of 800l. a-year.

MASTER of the Household, is an officer under the treasurer of the household, in the king's gift: his business is to survey the accounts of the household.—He has L. 66 : 13 : 4 a-year wages, and L. 433 : 6 : 8 board-wages.

MASTER of the Mint, was anciently the title of him who is now called *warden of the mint*; whose office is to receive the silver and bullion which comes to the mint to be coined, and to take care thereof. The office of master and worker is now distinct; and this officer is allowed for himself and three clerks 650l. a-year.

MASTER of the Ordnance. See *ORDNANCE*.

MASTER of the Revels, an officer with an appointment of 100l. a-year, whose business is to order all things relating to the performance of plays, masques, balls, &c. at court. Formerly he had also a jurisdiction of granting licences to all who travel to act plays, puppet-shews, or the like diversions; neither could any new play be acted at either of the two houses till it had passed his perusal and licence; but these powers were afterwards much abridged, not to say annihilated, by a statute for regulating playhouses, till the licensing plays by the lord chamberlain was established. This officer has a yeoman with L. 46 : 11 : 8 a-year.

MASTER of the Rolls, a patent-officer for life; who has the custody of the rolls and patents which pass the great seal, and of the records of the chancery.

In the absence of the lord chancellor or keeper, he also sits as judge in the court of chancery; and is by Sir Edward Coke called his *assistant*.

At other times he hears causes in the rolls-chapel, and makes orders and decrees. He is also the first of the masters of chancery, and has their assistance at the rolls: but all hearings before him are appealable to the lord chancellor.

He has also his writ of summons to parliament, and sits next to the lord chief justice of England on the second woolpack. He has the keeping of the parliament-rolls, and has the rolls-house for his habitation; as also the custody of all charters, patents, commissions, deeds, and recognizances, which being made of rolls of parchment gave rise to the name. Anciently he was called *clerk of the rolls*.

Concerning the authority of the master of the rolls to hear and determine causes, and his general power in the court of chancery, there were (not many years since) divers questions and disputes very warmly agitated; to quiet which it was declared by stat. 3. Geo. II. cap. 30. that all orders and decrees by him made, except such as by the course of the court were appropriated to the great seal alone, should be deemed to be valid; subject nevertheless to be discharged or altered by the lord chancellor, and so as they shall

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not be inrolled till the same are signed by his lordship.

In his gift are the six clerks in chancery, the examiners, three clerks of the petty-bag, and the six clerks of the rolls-chapel where the rolls are kept. See *ROLLS, CLERK, &c.*

The master of the rolls is always of the privy-council; and his office is of great profit, though much short of what it has been.

MASTER of a Ship, an officer to whom is committed the direction of a merchant-vessel, who commands it in chief, and is charged with the merchandises aboard.

In the Mediterranean the master is frequently called *patron*, and in long voyages *captain*.

It is the proprietor of the vessel that appoints the master; and it is the master who provides the equipage, hires the pilots, sailors, &c. The master is obliged to keep a register of the seamen and officers, the terms of their contract, the receipts and payments, and, in general, of every thing relating to his commission.

MASTER of a Ship of War, is an officer appointed by the commissioners of the navy, to take charge of navigating a ship from port to port under the direction of the captain. The management and disposition of the sails, the working of a ship into her station in the order of battle, and the direction of her movements in the time of action, and in other circumstances of danger, are also more particularly under his inspection. It is likewise his duty to examine the provisions, and accordingly to admit none into the ship but such as are sound, sweet, and wholesome. He is moreover charged with the stowage; and for the performance of these services he is allowed several assistants who are properly termed *mates* and *quarter-masters*.

MASTER of the Temple. The founder of the order of the templars, and all his successors were called *magni templi magistri*; and ever since the dissolution of the order, the spiritual guide and director of the house is called by that name. See *TEMPLE* and *TEMPLAR*.

There were also several other officers under this denomination, as master of the wardrobe, with a salary of 2000l. a-year; master of the harriers, with 2000l. a-year; master of the staghounds, with 800l. a-year; master of the jewel-office, &c. all now abolished.

MASTER and Servant; a relation founded in convenience, whereby a man is directed to call in the assistance of others, where his own skill and labour will not be sufficient to answer the cares incumbent upon him. For the several sorts of servants, and how that character is created or destroyed, see the article *SERVANT*. In the present article we shall consider, first, the effect of this relation with regard to the parties themselves; and secondly, its effects with regard to others.

1. The manner in which this relation affects either the master or servant. And, first, by hiring and service for a year, or apprenticeship under indentures, a person gains a settlement in that parish wherein he last served 40 days. In the next place, persons serving seven years as apprentices to any trade have an exclusive right to exercise that trade in any part of England. This law, with regard to the exclusive part, of

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Master. it, has by turns been looked upon as a hard law, or as a beneficial one, according to the prevailing humour of the times: which has occasioned a great variety of resolutions in the courts of law concerning it; and attempts have been frequently made for its repeal, tho' hitherto without success. At common law every man might use what trade he pleased; but this statute restrains that liberty to such as have served as apprentices: the adversaries to which provision say, that all restrictions (which tend to introduce monopolies) are pernicious to trade; the advocates for it allege, that unskilfulness in trades is equally detrimental to the public as monopolies. This reason indeed only extends to such trades, in the exercise whereof skill is required: but another of their arguments goes much farther; viz. that apprenticeships are useful to the commonwealth, by employing of youth, and learning them to be early industrious; but that no one would be induced to undergo a seven years servitude, if others, tho' equally skilful, were allowed the same advantages without having undergone the same discipline: and in this there seems to be much reason. However, the resolutions of the courts have in general rather confined than extended the restriction. No trades are held to be within the statute, but such as were in being at the making of it: for trading in a country village, apprenticeships are not requisite, and following the trade seven years is sufficient without any binding; for the statute only says, the person must serve as an apprentice, and does not require an actual apprenticeship to have existed.

A master may by law correct his apprentice for negligence or other misbehaviour, so it be done with moderation: though, if the master or master's wife beats any other servant of full age, it is good cause of departure. But if any servant, workman, or labourer, assaults his master or dame, he shall suffer one year's imprisonment, and other open corporal punishment, not extending to life or limb.

By service all servants and labourers, except apprentices, become intitled to their wages: according to agreement, if menial servants; or according to the appointment of the sheriff or sessions, if labourers or servants in husbandry: for the statutes for regulation of wages extend to such servants only; it being impossible for any magistrate to be a judge of the employment of menial servants, or of course to assess their wages.

2. Let us now see how strangers may be affected by this relation of master and servant; or how a master may behave towards others on behalf of his servant, and what a servant may do on behalf of his master.

And, first, the master may *maintain*, that is, abet and assist, his servant in any action at law against a stranger: whereas, in general, it is an offence against public justice to encourage suits and animosities, by helping to bear the expence of them, and is called in law *maintenance*. A master also may bring an action against any man for beating or maiming his servant: but in such case he must assign, as a special reason for so doing, his own damage by the loss of his service; and this loss must be proved upon the trial. A master likewise may justify an assault in defence of his servant,

and a servant in defence of his master: the master, because he has an interest in his servant, not to be deprived of his service; the servant, because it is part of his duty, for which he receives his wages, to stand by and defend his master. Also if any person do hire or retain my servant, being in my service, for which the servant departeth from me and goeth to serve the other, I may have an action for damages against both the new master and the servant, or either of them: but if the new master did not know that he is my servant, no action lies; unless he afterwards refuse to restore him upon information and demand. The reason and foundation upon which all this doctrine is built, seem to be the property that every man has in the service of his domestics; acquired by the contract of hiring, and purchased by giving them wages.

As for those things which a servant may do on behalf of his master, they seem all to proceed upon this principle, that the master is answerable for the act of his servant, if done by his command, either expressly given or implied: *nam qui facit per alium, facit per se*. Therefore, if the servant commit a trespass by the command or encouragement of his master, the master shall be guilty of it: not that the servant is excused, for he is only to obey his master in matters that are honest and lawful. If an innkeeper's servants rob his guests, the master is bound to restitution; for as there is a confidence reposed in him, that he will take care to provide honest servants, his negligence is a kind of implied consent to the robbery; *nam, qui non prohibet, cum prohibere possit, jubet*. So likewise if the drawer at a tavern sells a man bad wine, whereby his health is injured, he may bring an action against the master; for although the master did not expressly order the servant to sell it to that person in particular, yet his permitting him to draw and sell it at all is impliedly a general command.

In the same manner, whatever a servant is permitted to do in the usual course of his business, is equivalent to a general command. If I pay money to a banker's servant, the banker is answerable for it: if I pay it to a clergyman's or a physician's servant, whose usual business it is not to receive money for his master, and he imbezzles it, I must pay it over again. If a steward lets a lease of a farm, without the owner's knowledge, the owner must stand to the bargain; for this is the steward's business. A wife, a friend, a relation, that use to transact business for a man, are *quoad hoc* his servants; and the principal must answer for their conduct: for the law implies, that they act under a general command; and without such a doctrine as this no mutual intercourse between man and man could subsist with any tolerable convenience. If I usually deal with a tradesman by myself, or constantly pay him ready money, I am not answerable for what my servant takes up upon trust; for here is no implied order to the tradesman to trust my servant: but if I usually send him upon trust, or sometimes on trust and sometimes with ready money, I am answerable for all he takes up; for the tradesman cannot possibly distinguish when he comes by my order and when upon his own authority.

If a servant, lastly, by his negligence does any damage to a stranger, the master shall answer for his neglect:

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glect: if a smith's servant lames a horse while he is shoeing him, an action lies against the master, and not against the servant. But in these cases the damage must be done while he is actually employed in the master's service; otherwise the servant shall answer for his own misbehaviour. Upon this principle, by the common law, if a servant kept his master's fire negligently, so that his neighbour's house was burned down thereby, an action lay against the master; because this negligence happened in his service: otherwise, if the servant, going along the street with a torch, by negligence sets fire to a house; for there he is not in his master's immediate service, and must himself answer the damage personally. But now the common law is, in the former case, altered by statute 6 Ann. c. 3. which ordains, that no action shall be maintained against any in whose house or chamber any fire shall accidentally begin; for their own loss is sufficient punishment for their own or their servant's carelessness. But if such fire happens through negligence of any servant (whose loss is commonly very little), such servant shall forfeit 100l. to be distributed among the sufferers; and, in default of payment, shall be committed to some workhouse, and there kept to hard labour for 18 months. A master is, lastly, chargeable if any of his family layeth or casteth any thing out of his house into the street or common highway, to the damage of any individual, or the common nuisance of his majesty's liege people: for the master hath the superintendence of all his household. And this also agrees with the civil law; which holds, that the *pater familias*, in this and similar cases, *ob alterius culpam tenetur, five servi, five liberi*.

We may observe, that in all the cases here put, the master may be frequently a loser by the trust reposed in his servant, but never can be a gainer: he may frequently be answerable for his servant's misbehaviour, but never can shelter himself from punishment by laying the blame on his agent. The reason of this is still uniform and the same; that the wrong done by the servant is looked upon in law as the wrong of the master himself; and it is a standing maxim, that no man shall be allowed to make any advantage of his own wrong.

MASTER-Load, in mining, a term used to express the larger vein of a metal, in places where there are several veins in the same hill. Thus it often happens, that there are seven, sometimes five, but more usually three veins or loads, parallel to each other, in the same hill. Of these the middle vein is always much the largest. This is called the *master-load*; and the others which lie three, two, or one on each side of this, are called the *concomitants* of the master-load.

MASTER-Word, in botany. See *IMPERATORIA*.

MASTICATION, the action of chewing, or of agitating the solid parts of our food between the teeth, by the motion of the jaws, the tongue, and the lips, whereby it is broken into small pieces, impregnated with saliva, and so fitted for deglutition and a more easy digestion. See *ANATOMY*, n° 104.

MASTICH, a kind of resin exuding from the lentiscus tree; and brought from Chio, in small yellowish transparent grains or tears, of an agreeable smell, especially when heated or set on fire. See *PISTACHIA*.

This resin is recommended in old coughs, dysenteries, hæmoptoes, weakness of the stomach, and in general in all debilities and laxity of the fibres. Geoffroy directs an aqueous decoction of it to be used for these purposes: but water extracts little or nothing from this resin. Rectified spirit almost entirely dissolves it, and the solution is very warm and pungent. Mastich is to be chosen in drops, clear, well-scented, and brittle.

We meet with a kind of cement sometimes kept in the shops under the name of mastich. It is composed of this gum, and several other ingredients, and is formed into cakes for use. This is intended for the service of lapidaries, to fill up cracks in stones, &c. but is by no means to be used for any medicinal purposes.

MASTICOT, or *YELLOW LEAD*, is the calx or ashes of lead, gently calcined, by which it is changed to a yellow or lighter or deeper tint, according to the degree of calcination. Masticot is sometimes used by painters, and it serves medicinally as a drier in the composition of ointments or plasters. The masticot which is used by the Dutch as the ground of their glazing, is prepared by calcining a mixture of one hundred weight of clean sand, forty-four pounds of soda, sold with us under the name of barilla, and thirty pounds of pearl-ashes.

MASTIFF-DOG, or *BAND-DOG*, (*canis villaticus* or *catenarius*), is a species of great size and strength, and a very loud barker. Manwood says, that it derives its name from *mase thefese*, being supposed to frighten away robbers by its tremendous voice. Great Britain was formerly so noted for its mastiffs, that the Roman emperors appointed an officer in this island, with the title of *Procurator Cynegii*, whose sole business was to breed, and transmit from hence to the amphitheatre, such as would prove equal to the combats of the place. Strabo, lib. iv. tells us, that the mastiffs of Britain were trained for war, and used by the Gauls in their battles. See *CANIS*.

MASTIGADOUR, or *SLABBERING-BIT*, in the manege, a snaffle of iron, all smooth, and of a piece, guarded with paternosters, and composed of three halves of great rings, made into demi-ovals, of unequal bigness; the lesser being inclosed within the greater, which ought to be about half a foot high.

MASULAPATAN, a populous town of Asia in the East Indies, and on the coast of Coromandel, in the dominions of the Great Mogul. It carried on a great trade, and most nations in Europe had factories here; but the English have now left it, and even the Dutch themselves have not above a dozen people here to carry on the chintz trade. The inhabitants are Gentoos, who will not feed on any thing that has life; and they had a famous manufacture of chintz, which is greatly decayed since the English left off buying. The Great Mogul has a custom-house here; and the adjacent countries abound in corn, tobacco, and timber for building. It is seated on the west side of the Bay of Bengal, 200 miles north of fort St George. W. Long. 81. 25. N. Lat. 16. 30.

MATACA, or *MANTACA*, a commodious bay in America, on the north coast of the island of Cuba. Here the galleons usually come to take in fresh water

Masticot
||
Mataca.

Mataman in their return to Spain. It is 35 miles from the Havannah. W. Long. 85. 6. N. Lat. 25. 0.

Matching,

MATAMAN, a country of Africa, bounded by Benguela on the north, by Monomotopa on the east, by Cafraria on the south, and by the Atlantic Ocean on the west. There is no town in it, and the inhabitants live in miserable huts, it being a desert country, and but little visited by the Europeans.

MATAN, or MACTAN, an island of Asia in the East-Indian sea, and one of the Philippines. The inhabitants have thrown off the yoke of Spain; and it was here that Magellan was killed in April 1521.

Cape MATAPAN, the most southern promontory of the Morea, between the gulph of Coran and that of Colo-China.

MATARAM, a large town of Asia, formerly the capital of an empire of that name in the island of Java. It is strong by situation, and is seated in a very fertile, pleasant, and populous country, surrounded with mountains. E. Long. 111. 25. S. Lat. 7. 55.

MATARO, a town of Spain, in Catalonia; seated on the coast of the Mediterranean, 15 miles north-east of Barcelona, and 35 south-west of Gironne. It is a small town, but industrious and well-peopled; and the environs abound in vineyards, which produce wine much famed for its flavour. It likewise contains several manufactories, and is considered as one of the richest and most active towns in Catalonia. E. Long. 2. 35. N. Lat. 41. 30.

MATCH, a kind of rope slightly twisted, and prepared to retain fire for the uses of artillery, mines, fire-works, &c.

It is made of hempen-tow, spun on the wheel like cord, but very slack; and is composed of three twists, which are afterwards again covered with tow, so that the twists do not appear: lastly, it is boiled in the lees of old wines. This, when once lighted at the end, burns on gradually and regularly, without ever going out till the whole be consumed: the hardest and driest match is generally the best.

Quick-Match. See *Quick-Match*.

MATCHING, in the wine-trade, the preparing vessels to preserve wines and other liquors, without their growing sour or vapid. The method of doing it is as follows: Melt brimstone in an iron ladle, and when thoroughly melted, dip into it slips of course linen-cloth; take these out, and let them cool: this the wine-coopers call a *match*. Take one of these matches, set one end of it on fire, and put it into the bung-

hole of a cask; stop it loosely, and thus suffer the match to burn nearly out: then drive in the bung tight, and set the cask aside for an hour or two. At the end of this time examine the cask, and you will find that the sulphur has communicated a violent pungent and suffocating scent to the cask, with a considerable degree of acidity, which is the gas and acid spirit of the sulphur. The cask may after this be filled with a small wine which has scarce done its fermentation; and bunging it down tight, it will be kept good, and will soon clarify: this is a common and very useful method; for many poor wines could scarce be kept potable even a few months without it.

MATE of a *SHIP of WAR*, an officer under the direction of the master, by whose choice he is generally appointed, to assist him in the several branches of his duty. Accordingly, he is to be particularly attentive to the navigation in his watch, &c. to keep the *log* regularly, and examine the line and glasses by which the ship's course is measured, and to adjust the sails to the wind in the fore-part of the ship. He is to have a diligent attention to the cables, seeing that they are well coiled and kept clean when laid in the tier, and sufficiently served when employed to ride the ship. Finally, he is to superintend and assist at the stowage of the hold, taking especial care that all the ballast and provisions are properly stowed therein.

MATE of a *Merchant-Ship*, the officer who commands in the absence of the master thereof, and shares the duty with him at sea; being charged with every thing that regards the internal management of the ship, the directing her course, and the government of her crew.

The number of mates allowed to ships of war and merchantmen is always in proportion to the size of the vessel. Thus a first-rate man of war has six mates, and an East-Indiaman the same number; a frigate of 10 guns, and a small merchant-ship, but only one mate in each; and the intermediate ships have a greater or smaller number, according to their several sizes, or to the services on which they are employed.

DURA and PIA MATER, the names given by anatomists to the two membranes which surround the brain. See ANATOMY, n^o 129, 130.

MATERA, a considerable town of Italy, in the kingdom of Naples, and in the Terra d'Otranto, with a bishop's see, seated on the river Canapro. E. Long. 16. 43. N. Lat. 40. 51.

Mate,
Matera.

M A T E R I A M E D I C A,

Of Classi-
fication.

A GENERAL name for every substance used in medicine, and by some extended even to every article used as food or drink.

Thus the materia medica becomes exceedingly extensive: however, before we enter upon any particular discussion of the subject, it appears proper to give some general idea of medicines and their operation.

A *medicine*, properly so called, is a substance which, when applied to the living human body, makes such an alteration in it as either to prevent the approach of disease, or to remedy a morbid state when already present.

Such substances as may be used for these purposes without any great preparation are called *simple medicines*, or *simples*; and with these the writers on materia medica are chiefly conversant. In treatises written professedly on this subject, it is common to give a particular description of each article, the characteristic marks by which it may be distinguished from all other substances, and the methods by which an adulteration or an imperfection may be discovered in it, together with the dose in which it can safely be given: but as all these particulars are taken notice of in different

Of Classi-
fication.

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cation.

different parts of this work, it is only necessary here to mention the general classification, and enumerate the names of the various substances used in medicine, after giving, as hath been already promised, a brief and general account of their mode of operation.

Concerning the manner in which medicines act, physicians have greatly differed, and each has followed his own particular theory. The followers of Boerhaave have supposed their action to be directly upon the solids and fluids; while those who build their theories on the hypothesis of Hoffman have asserted, that all medicines act immediately upon the nervous system, and from thence only in a secondary manner are their effects diffused over the solids and fluids. To discuss this question is not our business at present: neither indeed is it a matter of great consequence whether it be discussed or not; seeing all parties must own, that certain effects follow the use of certain particular substances, whether these substances act first upon the nervous system or upon the solids and fluids.

From their operations on the human body medicines are most usually divided into classes. Some are found to have the property of rendering the solid parts of the body more lax than before, and are therefore called *relaxing* medicines: Others there are which have an effect directly contrary, and are therefore called *indurating* medicines: A third kind are found to excite inflammation in the part to which they are applied, and are therefore called *inflammatory* medicines: And, lastly, a fourth kind are found remarkably either to increase or diminish the vigour of the body, or what is called the *tone* of the solids; and have therefore got the name of *tonics* if they increase, and *sedatives* if they diminish, this tone.

Some medicines are supposed neither remarkably to increase nor diminish the tone of the solids; but to perform their office either by correcting some morbid matter in the body, or by evacuating it: in the former case they are called *alterants*, in the latter *evacuants*.

These are the general divisions or classes into which medicines are commonly divided; but when we begin more particularly to consider their virtues, a great many inferior divisions arise.—Of the relaxing medicines, some, when externally applied, are supposed only to soften the part; and in that case are called *emollients*: while others, which have a power of converting the humours stagnating in any inflamed part into pus, are called *maturants*, or *suppuratives*. Sedative medicines, externally applied, are sometimes called *paregorics*: when taken internally, if they take off a spasm then existing in the body, they are called *antispasmodics*; if they mitigate pain, *anodynes*; if they produce a quiet sleep, *hypnotics*; or if they produce a very deep and unnatural sleep, together with a remarkable stupefaction of the senses, they are then called *narcotics*.

Tonic medicines obtain the name of *corroboratives*, *analeptics*, or *nervine* medicines, when they slightly increase the contractile power of the solids; but of *astringents*, if they do this in a great degree, especially if at the same time that they indurate the solids they also coagulate the fluids. Some of these medicines have received names from their supposed virtue of pro-

moting the growth of the flesh, consolidating wounds, and stopping fluxes of blood: but it is now discovered that no medicines whatever are endowed with any such powers; and therefore the divisions into *sarcolics*, *traumatics*, or *vulneraries*, &c. are seldom used.

—If astringent medicines are used with an intention to drive, by the constriction which they occasion, any kind of matter from the surface towards the internal parts of the body, they are called *repellents*; but if they insensibly expel any kind of stagnating matter from the parts where it is contained, they are then called *discutients*; and lastly, *stimulants*, or *attractives*, if they bring a greater flux of humours to the part to which they are applied.

As to medicines of the inflammatory kind, they are divided into *vesicatories* or blisters, which by their application raise watery bladders on the skin; and *catheratics*, *escharotics*, or *corrosives*, if they eat into and destroy the substance of the solid parts themselves. Another subdivision has been added, viz. that of *rube-factive* medicines, or such as only induce a redness on the part to which they are applied; but these belong to the vesicatories, and what proves only *rube-factive* to one will frequently blister another.

The alterants are divided into *absorbents*, such as by their alkaline quality neutralise and destroy any acid matter which may be in the stomach; and *antiseptics*, or those which correct any putrid matter in it; *coagulants* when they thicken the humours, and *resolvents* if they thin them; *heating* medicines when they increase the velocity of the blood, and *refrigerating* if they diminish it.

The evacuating medicines are divided according to the nature of the humour they evacuate. Thus, if they evacuate the contents of the stomach by vomiting, they are called *emetics*; if they induce purging, they are called *cathartics*; if they only evacuate the immediate contents of the intestines, they are named *ecceprotics*; or if a moderate evacuation is produced, without sickness or pain, they are called *laxatives*.—The medicines which gently promote the expulsion of humours through the pores of the skin, are called *diaphoretics*. If they do this in great quantity and with violence, they are called *sudorifics*. Such as excite urine, are called *diuretics*. Such as produce their evacuation by the glands of the palate, mouth, and salivary ducts, are called *salivating* medicines; those which promote the evacuation of mucus from the throat, are called *apophlegmatics*; while those which evacuate by the nose, are called *ptarmics*, *errhines*, *sternutatories*; and those which promote the menstrual flux, *emmenagogues*.—To the order of evacuants also some reduce those medicines which expel any unnatural bodies, as worms, stones, and flatus. Those which destroy worms are called *anthelmintics*; those which dissolve the stone in the bladder, *lithontriptics*; and such as expel flatus, *carminatives*.

According to these divisions Mr Vogel classes the articles of his Materia Medica; but Dr Lewis chooses to arrange them according to the natural qualities of the substances themselves, and not their effects on the human body.

Writers on the materia medica (he observes) have taken great pains in arranging the various articles of which

Of Arrangement.

which it is composed, into different divisions and subdivisions, according to their real or reputed medicinal powers.

It has been imagined, that the whole materia medica is reducible under the three distinctions of *alteratives*, *evacuants*, and *restoratives*: the first comprehending all that has any power to alter the constitution, without sensibly increasing or diminishing any of the natural evacuations; the second, whatever visibly promotes those discharges; and the third, all that contributes to lessen them, and make the increase greater than the waste. These divisions being too general, they are broken into subdivisions; and these again are further divided into different classes, under more restrained denominations, as cardiac, carminative, hystric, stomachic, &c.

Specious as this plan may appear to be, he imagines the execution of it, to any useful purpose, would require a far more extensive knowledge of the nature and operation of medicines than has yet been attained to. A just and useful method of simples is scarcely to be expected, while those properties on which the method is founded are imperfectly known, and in many articles only conjectural.

In all the arguments that have been hitherto contrived upon this plan, there appears a striking incongruity among the several articles of which even the ultimate subdivisions are composed; substances extremely dissimilar being classed together, as cantharides and tea, tobacco and bran, hemlock and cowslips, scurvy-grass and raisins, arum root and liquorice, wormwood and parsnips, cinnamon and nettles, raspberries and chalk, artichokes and alum, cloves and coffee, mustard-seed and black cherries, &c. Nor are these incongruities to be laid always to the charge of the authors, the nature of the system itself rendering them often unavoidable; for the particular effect which intitles a medicine to a particular class, may be produced by substances very dissimilar, and even opposite, in their general powers: thus the alvine excretions are restrained by starch, wax, tormentil-root, opium; among the capital diuretics are cantharides, nitre, salt, fixt alkaline salts, squills. It should seem that the method of arrangement cannot be a just one which requires substances so discordant to be ranked together, and which further requires each of these substances to be ranked over again, in other classes, along with other substances to which they are equally discordant.

There is also a material imperfection in this scheme, even in the primary divisions. Steel and its preparations act, in different circumstances, both as evacuants and restoratives. Mercury and antimony afford, in their different preparations, both evacuants and alteratives; and there are many other drugs which are sometimes used as alteratives, and sometimes as evacuants; indeed, all evacuants, in diminished doses, seem to act merely as alteratives. It should seem therefore, that "the division of the whole materia medica into alteratives, evacuants, and restoratives," is a division not founded in nature, even if there was no objection to the vague meaning of the appellations themselves.

Cartheuser has divided the materia medica on a

plan which appears more rational. Instead of the operations of medicines in the human body, which are precarious, complicated, and greatly diversified according to the dose, the preparation, and the circumstances of the patient, he takes for the basis of his arrangement their more simple, obvious, and constant properties, as bitterness, sweetness, astringency, acidity, &c. Having considered the nature of bitterness, for instance, in general, he examines what effects medicines possessed of this property are capable of producing in the body, and in what circumstances they may be expected to be serviceable, and then proceeds to an account of the particular bitters.

This method is of real use, but its use is limited to a small part of the materia medica. There are many of the medicinal simples, in which we can distinguish no prevailing qualities of this kind; there are many, in which different qualities are blended together; and many which, though similar in these kinds of qualities, are very dissimilar in their operations in the human body: thus though gentian and aloes agree in having a bitter taste, and sugar and manna in being sweet, their medicinal virtues are respectively very different. Accordingly, the author is obliged in some cases to depart from his general plan, and found the division on the medicinal effects: he makes one class of purgatives and emetics, and another of vaporose inebriants and narcotics: this last class consists of tobacco, elder-flowers, saffron, opium, and poppy-seeds, substances certainly very discordant in all their qualities that relate to medicinal intentions.

In this article, instead of attempting a medicinal distribution of the simples, which we apprehend not to be practicable to any good purpose, we shall, after Dr Lewis, adopt the alphabetical mode of arrangement, as possessing upon the whole a decided superiority over every other. We shall, however, premise, from the same ingenious author, some general observations on certain classes of medicines, in Cartheuser's manner; and thus preserve the less exceptionable parts of his plan, with some amendments.

ART. I. ACIDS.

- | | |
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| | { native; as sorrel, wood-sorrel, juice of lemon, oranges, barberries, and other fruits. |
| Class 1. <i>Vegetable</i> | |
| | { produced by fermentation; as vinegar and tartar. |
| Class 2. <i>Mineral</i> : | the acids of vitriol, nitre, and common salt. |

THE medical effects of acids, duly diluted and given in proper doses, are, to cool, quench thirst, correct a tendency to putrefaction, and allay inordinate motions of the blood. By these qualities, in hot bilious temperaments and inflammatory disorders, they frequently restrain immoderate hæmorrhages, and promote the natural secretions; in some kinds of fever, they excite a copious diaphoresis, where the warm medicines, called *alexipharmic*, tend rather to prevent this salutary discharge.

Vegetable acids, particularly the native juices of certain plants and fruits, have some degree of a saponaceous quality; by means of which they attenuate

Acids.

or

Abſorbents. or diſſolve viſcid phlegm and deterge the veſſels, and thus prove ſerviceable in ſundry chronical diſorders. Inveterate ſcurvies have ſometimes yielded to their continued uſe, eſpecially when given in conjunction with medicines of the acrid or pungent kind: experience has ſhown, that the acrid antiſcorbutics have much better effects when thus managed than when exhibited by themſelves; hence in the *Jucci ſcorbutici* of our diſpenſatory, Seville orange juice is uſefully joined to that of the *cochlearia* and *naſturtium*.

The mineral acids inſtantly coagulate blood: the vegetable dilute it, even when inſpiffated or thickened by heat; in which ſtate, watery liquors will not mingle with it. Hence, in ſome fevers, where water runs off by the kidneys almoſt as pale and inſipid as it was drank, vegetable acids render the urine of the due colour and quality. The mineral acids (the ſpirit of nitre in particular) combined with vinous ſpirits, have a like effect.

Acids are prejudicial in cold, pale, phlegmatic habits, where the veſſels are lax, the circulation languid, bile deficient, and the power of digeſtion weak. In theſe caſes, an acid is often generated in the ſtomach, from milk and moſt vegetable foods; which, whiſt it continues in the firſt paſſages, occasions uneaſineſs about the ſtomach, flatulencies, ſometimes griping pains of the bowels, and vomitings.

ART II. INSIPID EARTHS capable of ABSORBING ACIDS.

Oyſter-ſhells,	Chalk,
Crabs claws and eyes ſo called,	Some marles,
Coral, red and white,	Lime-ſtones,
Pearls,	Marbles,
Bezoar,	Spars.

The virtues of theſe ſubſtances are, to abſorb or deſtroy acidities in the firſt paſſages, and conſequently to remove ſuch diſorders as proceed from that cauſe. The cordial, alexipharmic, antifebrile, and other like virtues attributed to theſe medicines, appear to have little foundation; or at beſt are only ſecondary ones. When united with the acid, they form a neutral ſaline compound, poſſeſſing ſome degree of an aperient and detergent quality, though too inconfiderable to be in general regarded.

The abſorbent earths were all ſtrangers to medicine in the earlier times; and their uſe does not ſeem to have been eſtabliſhed before the laſt century; when ſome practitioners, from an opinion that moſt kinds of diſeaſes proceeded from a preternatural acid, introduced a great variety of antacid bones, both of the earthy and ſaline kind, and very liberally exhibited them on almoſt every occaſion.

It is certain, that in children, and adults of a weak conſtitution, and whoſe food is chiefly of the vegetable aceſcent kind, ſundry diſorders are occaſioned by acidities; theſe readily diſcover themſelves by ſour eructations, the pale colour of the face, and in children by the ſour ſmell and green colour of the alvine ſæces, which are ſometimes ſo manifeſtly acid as to raiſe a ſtrong efferveſcence with alkaline ſalts. In

theſe caſes, and theſe only, the uſe of abſorbent earths **Abſorbents.** is indicated.

If there are really no acid juices in the ventricle, theſe earths are apt to concrete with the mucous matter uſually lodged there, into hard indiffoluble maſſes; which have ſometimes been thrown up by vomit, or found in the ſtomach upon diſſection. Hence indigeſtion, loſs of appetite, nauſea, vomiting, obſtructions of the bowels, and other diſorders. Sometimes the ſtomach and inteſtines have been found lined with a cruſt, as it were, of theſe earthy bodies, which muſt not only have prevented the ſeparation of the gaſtric liquor, but likewiſe have cloſed the oriſices of the lacteal veſſels, ſo as to obſtruct the paſſage of the chyle into the maſs of blood.

Some ſuppoſe the earthy powders capable (without the concurrence of any acid) of paſſing the lacteals along with the chyle; and allege, in ſupport of this opinion, that, when triturated with water, they are in part taken up and carried with it through a filter of paper; the filtrated liquor leaving, upon evaporation, a portion of whitish earthy matter. This experiment (allowing the conſequence to be juſtly drawn from it) is itſelf erroneous: the reſiduum proceeds from the earth naturally contained in the water, not from that employed in the experiment; for if pure diſtilled water be made uſe of, it will leave no reſiduum, though long triturated or digeſted with the earth.

All theſe bodies, particularly thoſe of the animal kind, contain, beſides their purely alkaline earth, a portion of glutinous matter. An inſtance of this we have in crabs-eyes, which if macerated in the weaker acids, or in the ſtronger ſufficiently diluted with water, the earthy part will be diſſolved, and the animal-glue remain in form of a ſoft transparent mucilage. The glutinous ſubſtance increaſes their tendency to concrete in the ſtomach; and thence thoſe which contain leaſt thereof ſhould be preferred to the others. The mineral earths contain the leaſt of this kind of matter, and ſome of them are very eaſy of ſolution; chalk, for inſtance, which may therefore be given with greater ſafety than the animal-abſorbents. Theſe ſubſtances, divelved of their conglutinating matter by means of fire, are reduced into acrimonious calces or limes, and thus become medicines of a different claſs.

The teeth, bones, hoofs, and horns of animals conſiſt of the ſame principles with the animal-abſorbents above mentioned, but combined in different proportions: the quantity of gelatinous matter is ſo large, as to defend the earthy part from the action of weak acids; whiſt the earth, in its turn, protects the gluten from being eaſily diſſolved by watery liquors. Hence theſe bodies in their crude ſtate, though recommended as poſſeſſing ſingular virtues, are not found to have any virtue at all.

Experiments have been made for determining the degree of ſolubility, or comparative ſtrength of theſe earths; the principal of which are arranged in the two following tables, one taken from Langius, and the other from Homberg.

TABLE

Abforbents.

TABLE of the quantity of Acid destroyed by different Abforbents.

Ten grains of	Some kinds of Limestones	destroyed the acidity of	160	Drops of Spirit of Salt.
	Oyster shells		120	
	Chalk		100	
	Shells of Garden-snails		100	
	Calcined Cray-fish		100	
	Pearls		80	
	Tooth of the Sea-horse		80	
	Volatile Salts		80	
	Fixed Salts		60	
	Coral, red and white		60	
	Crabs-eyes		50	
	Egg-shells		50	
	Mother-of-Pearl		50	
	Crabs-claws		40	
	Jaw-bone of the Pike-fish		30	

TABLE of the quantity of Absorbent Earths soluble in Acids.

576 grains of Spirit of Salt dissolved of	Crabs-eyes	216
	Mother-of-Pearl	144
	Pearls	128
	Oyster-shells	156
	Hartshorn	165
	Coral	186
	Oriental Bezoar	118
	Occidental Bezoar	123
576 grains of Spirit of Nitre dissolved of	Quick Lime	199
	Slacked Lime	193
	Crabs-eyes	277
	Mother-of-Pearl	202
	Pearls	219
	Oyster-shells	236
	Hartshorn	234
	Coral	233
	Oriental Bezoar	108
	Occidental Bezoar	144
	Quick Lime	180
	Slacked Lime	216

These experiments do not sufficiently ascertain the point intended by them: in the first sett, the quantity of acid is too vague and indetermined; in the second, we are not told whether the acid was perfectly saturated; and in both, the acids made use of were so very different from any that can be supposed ever to exist in the human body, that little can be concluded from them with regard to the medical effects of these absorbents. Trial should have been made with the mild vegetable acids, as the juices of certain fruits, sour fermented liquors, or rather with sour milk. Nevertheless these tables, though not so perfect as could be wished, have their use in the hands of such as can make proper allowances.

ART. III. EARTHS not DISSOLUBLE in Acids or other liquors.

These may be ranged in two classes.

Class 1. *Hard crystalline earths*: as the ruby, garnet, emerald, sapphire, hyacinth, and other precious stones; crystal, flint, &c.

THESE kind of substances were introduced into medicine, and many fabulous virtues attributed to them by the superstition of the earlier ages. Some of them are still preserved in foreign pharmacopœias, but at length very justly expunged from ours, notwithstanding what some late writers of repute speak of their medical virtue. These indissoluble hard bodies are not capable of producing any other effect, than by their rigid angular particles (which, though levigated with the utmost care, the microscope still discovers in them) to offend or wound the intestines. In levigation, they wear off so much from the hardest marble instruments, as will equal or exceed their own weight: from this circumstance we may account for their having sometimes appeared to act as absorbents. Some of these stones, exposed to a vehement fire, become in some measure friable; but nevertheless remain indissoluble. Most of the coloured ones by this treatment lose their colour; and in this state prove nearly of the same quality with common crystal: such are, the sapphire, emerald, amethyst, and cornelian. Others melt into a blackish vitreous matter, from which a portion of iron is obtainable by proper fluxes; as the hyacinth and garnet. Geoffroy concludes from hence, that these stones really possess some medical virtues, depending upon their metallic part: but the quantity of metallic matter, sufficient to give them a considerable tinct, is so exceedingly small, and so inclosed in a stony matter not at all soluble by any of the known menstrua, as scarce to admit of any possibility of its acting in the human body.

Class 2. *Softer earths*; the talky, gypseous, and argillaceous.

THE talcs and gypsums have rarely been used as medicines. Some of the former, from their unctuous softness and silver hue, stand recommended externally as cosmetics; and some of the latter, on little better foundation, internally as astringents. But they have long been deservedly rejected by the judicious practitioners. They seem to possess the ill qualities of the alkaline earth (concreting with the mucus of the stomach, &c.), without any of their good ones.

Several of the clays, boles, and terræ sigillatæ, were highly celebrated by the ancients as astringents and alexipharmics, and some of them still continue in esteem; though it is certain they have no great claim to the virtues that have been attributed to them. Their real effects are, to give a greater degree of consistency to the fluids in the first passages, and in some measure defend the solids from their acrimony.

Most of these bodies contain, besides the tenacious indissoluble earth, which is their principal characteristic, (1.) A portion of an earth soluble in acids similar to those of the first section. (2.) Of acid, separable by distillation in a strong fire: this acid is always of the same nature with that obtained from vitriol, sulphur, and alum. (3.) The coloured ones contain likewise small quantities of iron, reducible, by inflammable fluxes, into its metallic form. In consequence of the first of these ingredients, these earths may be looked upon in some measure as absorbent: the acid appears to be united with a part of the absorbent earth into a saline compound, approaching to an aluminous nature; whence they have some degree of astringency:

Glutinous and Unctuous substances. gency: whether they receive any peculiar virtue from the iron, is greatly to be doubted; since it is in a very crude state, and in quantity extremely small.

These earths unite with water into a turbid liquor, slippery and smooth to the touch, and remain for some time suspended; the sand, grit, or other grosser matters, which are often found naturally mingled with them, subsiding. They may be freed by means of acids from their alkaline earth; by coction in water, from their saline matter; and the coloured ones from their iron by digestion in aqua-regis, the only menstruum we are acquainted with that will extract the ferrugineous matter of argillaceous and solar earths. This purified, they have all nearly the same appearance and qualities. Exposed to a strong fire, they lose their soft glutinous quality, and are reduced into hard masses, indissoluble as at first.

ART. IV. GLUTINOUS Vegetable and Animal Substances.

Class 1. Vegetable.

Pure gums:	Vegetables abounding with mucilage:
Tragacanth,	Orchis root,
Seneca,	Althæa root,
The gums of cherry, plum, and other European trees.	Quince-seeds, &c.

Gums and mucilages are glutinous vegetable productions, of no particular taste or smell, soluble in water, but not in vinous spirits or in oils. They differ from one another only in degree of tenacity; the more tenacious are called *gums*; those which are less so, *mucilages*. The first naturally exude from certain trees and shrubs; the latter are extracted by art. Almost all vegetable substances contain some portion of these, which, after the resinous part has been extracted by spirit, may be separated from the remaining matter by means of water.

The general virtues of these kinds of substances are, to thicken the fluids, and defend the solids from them when grown sharp or corrosive. Hence their use in a thin acrimonious state of the juices, and where the natural mucus of the intestines is abraded.

Class 2. Animal.

Most animal substances (the fat excepted) contain a viscid matter, in many respects similar to the foregoing, and capable of being extracted by strong coction in water.

Animal glues and gellies have the general qualities of the vegetable gums and mucilages; with this difference, that the former are more nutritive, and apt to run into a putrid state. Considered as the subjects of chemistry, the difference betwixt them is very great: those of the animal kind are changed by fire into a volatile alkaline salt, and a fetid oil; the vegetable into an acid liquor, and a very small portion of oily matter, considerably less fetid than the former.

ART. V. Soft UNCTUOUS Substances.

Class 1. *Insipid vegetable oils; and substances abounding with them; as almonds, and the kernels of most fruits; linseed, and the medullary part of sundry other seeds.*

Class 2. *Animal fats; as spermaceti.*

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UNCTUOUS vegetables unite with water, by trituration, into a milky liquor; and give out their oil upon expression.—These kinds of oils and animal-fats dissolve not in any menstruum except alkaline ones; which change their quality, and reduce them into a soap, dissoluble in water, but more perfectly in vinous spirits; from this compound, the oil may, by a skilful addition of acids, be recovered in a purer state than before, and rendered soluble, like essential oils, in spirit of wine.

The medical virtues of these substances are, to obtund acrimonious humours, and to soften and relax the solids; hence their use internally in tickling coughs, heat of urine, pains, and inflammations; and externally in tension and rigidity of particular parts. The milky solutions, commonly called *emulsions*, though much less emollient than the oils themselves or animal-fats, have this advantage, that they may be given in acute or inflammatory distempers, without danger of the ill consequences which the others might sometimes produce: fats and oils, kept in a degree of heat no greater than that of the human body, soon become rancid and acrimonious; whilst emulsions tend rather to grow sour.

ART. VI. ASTRINGENTS.

Galls,	Balaustines,
Tormentil-root,	Terra Japonica,
Bistort-root,	Acacia, &c.

ASTRINGENT substances are distinguished by a rough austere taste; and changing solutions of iron, especially those made in the vitriolic acid, of a dark purple or black colour.

Astringents yield their virtues by infusion both to water and vinous spirits, generally in greatest perfection to the former. Oils extract nothing from them; nor do they give over any of their virtue in distillation: nevertheless their astringency is considerably abated by evaporating decoctions of them to the consistence of an extract, and totally destroyed by long keeping.

The medical effects of these kinds of substances are, to constrict the fibres, and incrassate or lightly thicken the juices. Their more experienced use is in disorders proceeding from a debility or flaccid state of the solids; in hæmorrhages, from a thinness of the blood, laxity or rupture of the vessels; in preternatural discharges of other kinds, after the offending matter has been duly corrected or evacuated; and in external relaxations.

In some cases, they produce the effects of aperients; the vessels, constricted and strengthened by them, being enabled to protrude the circulating juices with greater force.

A good deal of caution is requisite in the use of these medicines, especially those of the more powerful kind. In plethoric habits, inveterate obstructions, critical evacuations, and in all kinds of fluxes in general before the morbid matter has been expelled, or where there is any stricture or spasmodic contraction of the vessels, astringents prove eminently hurtful. Where critical dysenteries or diarrhœas are restrained by styptics, the acrimonious matter, now confined in the intestines, corrodes or enflames them; and sometimes occasions a gangrene of the parts.

ART. VII. SWEETS.

Sugar
Honey,Raisins,
Liquorice, &c.

THE vegetable sweets are a very numerous tribe; almost every plant that has been examined, discovering in some of its parts a saccharine juice. The bottoms of flowers, and most kinds of seeds and grain when they begin to vegetate, are remarkably sweet.

Vegetable sweets are extracted both by water and vinous spirits, most readily by the first, but in greatest perfection by the latter. Nothing of their taste arises in distillation with either of these liquors: nevertheless, by long boiling with water they become somewhat less agreeable; but are not much injured by being treated in the same manner with rectified spirit.

The purer sweets, as sugar, promote the union of distilled oils with watery liquors, and prevent the separation of the butyraceous part from milk: from this quality, they are supposed to unite the unctuous part of the food with the animal juices. Hence some have concluded, that they increase fat: others, that they have a contrary effect, by preventing the separation of the unctuous matter which forms the fat from the blood: and others, that they render the juices thicker and more sluggish, retard the circulation and cuticular excretion, and thus bring on a variety of disorders. But sweets have not been found to produce any of these effects in any remarkable degree: common experience shows, that their moderate, and even liberal, use is at least innocent; that they reconcile, not only to the palate, but to the stomach also, substances of themselves disgusting to both; and thus render salutary what would otherwise be injurious to the body.

The unctuous and mucilaginous sweets, as the impure sugars, liquorice, &c. have a considerable degree of emollient and lubricating virtue.—Those accompanied with a manifest acid, as in the juices of most sweet fruits, are remarkably relaxing; and if taken immoderately, occasion diarrhoeas and dysenteries, which sometimes have proved fatal.

ART. VIII. ACRIDS.

ACRIDS are substances of a penetrating pungency. Applied to the skin, they inflame or exulcerate it: chewed, they occasion a copious discharge of saliva: and snuffed up the nose, they provoke sneezing.

These substances, considered as the subjects of pharmacy, may be divided into three classes,

- Yielding their acrimony {
1. In distillation with water: as horse-radish, mustard, scurvy-grass, &c.
 2. By infusion only: as the greater celandine, pyrethrum, &c.
 3. Neither to infusion, nor distillation: as arum and dracunculus.

The general effects of acrid medicines are, to stimulate the vessels, and dissolve tenacious juices. In cold leucophlegmatic habits, stagnations of the fluids, and where the contractile power of the solids is weak, they prove powerful expectorants, deobstruents, diuretics, and emmenagogues; and if the patient is kept warm, sudorifics. In hot bilious constitutions, plethoric habits, inflammatory distempers, where there is al-

ready a degree of irritation, where the juices are too thin or acrimonious, or the viscera unsound, these stimulating medicines prove highly prejudicial, and never fail to aggravate the disease.

Certain acrid substances have been lately recommended in dry convulsive asthma: of the efficacy of the squill in particular, for the cure of this disorder, several instances are related in the *Commercium Literarium* of Norimberg for the years 1737 and 1739. Cartheuser thinks, that not the asthma itself, but a particular effect of it, was removed by this medicine. He observes, that in all asthmas the free circulation of the blood through the pulmonary vessels is impeded; and hence, during every paroxysm, the lungs are in a kind of oedematous state: that if this oedema, becoming habitual, remains after the fit is over, it is either perpetually occasioning fresh ones, or gives rise to a dropsy of the breast: that acrid medicines, by removing the oedema, remove what was originally an effect of the asthma, and in time a cause of its aggravation.

ART. IX. AROMATICS.

AROMATICS are substances of a warm pungent taste, and a more or less fragrant smell. Some of the spices are purely aromatic, as cubebs, pepper, cloves; some substances have a sweetness mixed with the aromatic matter, as angelica-root, aniseed, fennel-seed; some an astringency, as cinnamon; some a strong mucilage, as casia lignea; some a bitterness, as orange-peel. The aromatic matter itself, contained in different subjects, differs also not a little in its pharmaceutical properties. It is extracted from all by rectified spirit of wine; from some in great part, from others scarcely at all, by water. The aromatic matter of some subjects, as of lemon-peel, rises wholly in distillation both with spirit and water; that of others, as cinnamon, rises wholly with water, but scarcely at all with spirit; while that of others, as pepper, is in part left behind after the distillation of water itself from the spice.

With regard to the general virtues of aromatics, they warm the stomach, and by degrees the whole habit; raise the pulse, and quicken the circulation. In cold languid cases, phlegmatic habits, and a weak flaccid state of the solids, they support the vis vitæ, and promote the salutary secretions. In hot bilious temperaments, plethoric habits, inflammatory indispositions, dryness and strictures of the fibres, they are generally hurtful.

ART. X. BITTERS.

Gentian root, Lesser centaury,
Hops, Carduus, &c.

BITTERS for the most part yield their virtue both to watery and spirituous menstrua; some more perfectly to one, and others to the other. None of the substances of this class give over any thing considerable of their taste in distillation, either to water or to spirit; their bitterness remaining entire, and frequently improved, in the extracts. Such as are accompanied with flavour, as wormwood, may by this process be reduced into simple flavourless bitters.

These substances participate of the virtues of astringents and aromatics. Their general effects are, to constrict the fibres of the stomach and intestines, to warm the habit, attenuate the bile and juices in the

Emetics and Cathartics. first passages, and promote the natural evacuations, particularly of sweat and urine. In weakness of the stomach, loss of appetite, indigestion, and the like disorders, proceeding from a laxity of the solids, or cold sluggish indispotion of the juices, these kinds of medicines do good service. Where the fibres are already too tense and rigid, where there is any immoderate heat or inflammation, bitters very sensibly increase the distemper; and, if their use is continued, communicate it to the kidneys: hence the urine becomes high-coloured, small in quantity, and at length suppressed; a dropsy soon succeeding. If the kidneys were before so lax as to remain now uninjured, yet the other viscera become gradually more and more rigid, and a tabes is at length brought on.

Bitter substances destroy insects, and prevent putrefaction. Hence they are recommended as anthelmintic, and externally as antiseptics.

ART. XI. EMETICS and CATHARTICS.

Hellebore, Colocynth,
Julip, Scammony,
Ipecacuanha, Gamboge, &c.

THESE substances consist of a resinous part, in which the purgative or emetic quality resides: and a gummy saline one, which acts chiefly as a diuretic. The first is extracted or dissolved by vinous spirits; the latter by water. Nothing arises in distillation from either.

The acrid resins, exhibited by themselves, tenaciously adhere to the coats of the intestines, by their stimulating power irritate and inflame them, and thus produce sundry violent disorders. Hoffman relates, that he has sometimes observed convulsions, and a paralysis of both sides, from their use.

These inconveniences may be avoided, by previously triturating them with substances capable of dividing their tenacious texture, and preventing their adhesion; by this means they become mild and safe, operate without disturbance, and at the same time

more effectually answer the purposes intended by them.

Some have endeavoured to correct the ill quality of the resinous purgatives, by the addition of acids and aromatic oils. Acids weaken their power, but have no other effect than what a diminution of the dose would equally answer. The pungent essential oils may serve to warm the stomach, make the medicine sit easier, and thus prevent the nausea which sometimes happens; but as soon as the resin begins to exert itself in the intestines, these oils, instead of correcting, increase its virulence; being themselves apt to occasion the inconveniences which they are here intended to prevent, an irritation and inflammation of the bowels. Alkaline salts or soaps have a better effect; as they dispose the resin to solution, and promote its operation.

The medicines of this class seem to act by liquefying the juices, and stimulating the coats of the stomach and intestines. If the irritation is strong and sudden, their action is quick and upwards: if slower, downwards. Cathartics given in a liquid form, or in very sensible habits, often prove emetic; and emetics, where mucus abounds, cathartic. They operate more violently in robust constitutions than in those of a contrary temperament; the vessels being in the former more tense and rigid, and consequently less capable of bearing an equal degree of irritation.

The action of these medicines is extended beyond the primæ viæ: This appears evident from the increase of the pulse which always accompanies their operation; and from the common observation of children being purged by the milk, if the nurse has taken a cathartic. Some of them, particularly hellebore, are said to purge, if only applied externally in issue.—Purgatives, even of the more powerful kind, exhibited in suitable small doses, in conjunction with the milder aperients, may be introduced into the habit, so as to prove notable deobstruents, diuretics, and diaphoretics, without acting sensibly by stool.

A CATALOGUE of the SIMPLES used in the MATERIA MEDICA, exhibiting at one view their TECHNICAL NAMES, ENGLISH NAMES, PARTS USED IN MEDICINE, VIRTUES, and the different PREPARATIONS FROM THEM.—A particular account of the different articles of this list is given in the course of the alphabet, chiefly under the Linnean names: And the method of making the preparations from them are shown under the article PHARMACY. The notes subjoined at the bottom of the following pages are intended to supply some particulars relating to a few of the detached articles already past.

	TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	
List of Simples.	Abies ruber (<i>Pinus abies</i> , Lin.)	The fir-tree.	The wood, tops, and cones.	Diuretic and diaphoretic.	A decoction.	List of Simples.
	Abrotanum fœmina (<i>Santolin chamaecypar.</i> Lin.)	Lavender cotton.	The leaves.	Stimulant, detergent, and anthelmintic.	Decoction, and ointment for cutaneous eruptions.	
	Abrotanum mas (<i>Artemisia abrotanum</i> , Lin.)	Southernwood.	The leaves.	Stimulant, detergent, aperient, and sudorific,	Decoction and tincture; also lotion and ointment for cutaneous eruptions.	
	Abinthium maritimum (<i>Artemisia maritima</i> , Lin.)	Sea wormwood.	The tops.	Stomachic.	An oil, extract, conserve, and several distilled tincture-waters. They also enter the common fomentation and green oil.	
	Abinthium vulgare (<i>Artemisia absinthium</i> , Lin.)	Common wormwood.	The leaves and flowering tops.	Stomachic.		

TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Acacia Germanica (<i>Prunus spinosa</i> , Lin.)	The floc.	Inspissated juice.	Astringent.	
Acacia vera (<i>Mimosanilotica</i> , Lin.)	Acacia.	Inspissated juice.	Astringent.	
Acetosa (<i>Rumex acetos.</i> Lin.)	Sorrel.	Leaves.	Astringent and antiscorbutic.	An essential salt for taking out spots in clothes. A decoction.
Acetosella (<i>Oxalis acetosel.</i> Lin.)	Wood sorrel.	The leaves.	Astringent and antiscorbutic.	A conserve.
Acetum.	Vinegar.		Cordial, refrigerant, sudorific, and antiseptic.	A distilled spirit.
Aconitum (<i>A. napellus</i> , Lin.)	Wolf's-bane.	The herb and leaves.	Narcotic.	Tincture.
Acorus. See <i>Calamus arom.</i> infra.				
Adiantum verum (<i>Adiant. capill. Ven.</i> Lin.)	Maiden-hair.	The leaves.	Attenuating and aperient.	Decoction and syrup; its virtues best obtained from an infusion of the herb sweetened with sugar and liquorice, and drank as tea.
Aer dephlogisticus.	Dephlogisticated air.		Supposed to be antiseptic and corroborative.	
Aer mephiticus.	Fixed air.		Antiseptic and lithontriptic.	
Aer nitrosus.	Nitrous air.		Very antiseptic.	
Æs. See <i>Cuprum</i> .	Brass. See <i>Copper</i> .			
Agaricus, (<i>Boletus pini laricis</i> , Lin.)	Agaric.		Cathartic.	An aqueous extract, but now much disused.
Agaricus chirurgorum (<i>Boletus ignarius</i> , Lin.)	Female agaric, or agaric of the oak, touchwood, or spunk.		Styptic.	Pieces applied externally.
Agnus castus (<i>Vitex agnus castus</i> , Lin.)	The chaste tree.	The seeds.	Antaphrodisiac.	
Agrimonia (<i>A. Europæica</i> , Lin.)	Agrimony.	The leaves.	Attenuant and tonic.	Digested in whey, it forms a diet-drink used by some in the spring.
Albumen ovi.	White of an egg.		Discutient.	
Alchemilla (<i>A. vulgaris</i> , Lin.)	Ladies-mantle.	The leaves.	Astringent.	
Alkekengi, (<i>Physalis alkekengi</i> , Lin.)	Winter-cherry.	The fruit.	Aperient and diuretic.	Dried and powdered. Inspissated juice.
Alliaria (<i>Erysimum allaria</i> , Lin.)	Sauce-alone, or Jack-by-the-hedge.	The leaves.	Sudorific and deobstruent.	
Allium (<i>A. sativum</i> , Lin.)	Garlic.	The roots.	Stimulant, attenuant, discutient, and diuretic.	A syrup and oxymel, ointment and poultice.
Alnus (<i>Betula alnus</i> , Lin.)	Alder.	Leaves and bark.	Astringent.	Decoction. The leaves chopt and heated, efficacious for dispersing milk in the breasts.
Aloes (<i>Aloe perfoliata</i> , Lin.)	Aloes.	Inspissated juice.	Cathartic.	Ingredient in several tinctures and pills.
Alfene (<i>A. med.</i> Lin.)	Chickweed.	The leaves.	Refrigerant.	

List of Simples.	TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	List of Simples.
	<i>Althæa</i> (<i>A. officinalis</i> , Lin.)	Marshmallow.	The leaf and root.	Emollient.	A syrup and ointment.	
	<i>Alumen</i> .	Alum.	The whole.	Strongly astringent.	A styptic powder, styptic water, whey, &c.	
	<i>Ambragrifea</i> .	Ambergrise.	The whole.	A high cordial.	A tincture or essence.	
	<i>Ammi vulgaris</i> .	Bishop's weed.	The leaves.	Stimulant.	An ingredient in the theriaca.	
	<i>Amomum verum</i> .	True amomum.	The seeds.	Aromatic.	An ingredient in the theriaca.	
	<i>Amomum vulgare</i> (<i>Sison</i> , Lin.)	Bastard stone-parsley.	The seeds.	Carminative and diuretic.		
	<i>Ammoniacum</i> . See <i>Gummi</i> .					
	<i>Amygdala</i> (<i>Am. con.</i> Lin.)	Sweet and bitter almonds.	The fruit.	Relaxing.	Expressed oil and emulsion.	
	<i>Amylum</i> .	Starch.		Astringent.		
	<i>Anacardium occidentale</i> , (Lin.)	Cashew-tree.	The nuts.	Corrosive.	Oil outside, but the kernels used as almonds; the gum instead of gum arabic.	
	<i>Anagallis</i> (<i>Arvensis</i> , Lin.)	Pimpernel.	The leaves.	Sudorific and nervine.	Extract, or inspissated juice.	
	<i>Ananas</i> (<i>Bromelia ananas</i> , Lin.)	The pine-apple.	The fruit.	Refrigerant.		
	<i>Anchusa</i> (<i>A. tinctoria</i> , Lin.)	Alkanet.	The root.	Only used for its colour.		
	<i>Anethum</i> (<i>A. graveolens</i> , Lin.)	Dill.	The seeds.	Carminative.	Distilled oil, water, and spirituous extract.	
	<i>Angelica</i> (<i>A. Archangelica</i> , and <i>sylvestris</i> , Lin.)	Angelica.	The roots, stalks, leaves, and seeds.	Aromatic.	Several compound waters.	
	<i>Angusturæ cortex</i> , (A)					
	<i>Anisum</i> (<i>Pimpinella anisum</i> , Lin.)	Anise.	The seed.	Aromatic and tonic.	An essential oil, a spirituous compound water, &c.	
	<i>Antimonium</i> .	Antimony.		Diaphoretic, cathartic, emetic, or caustic.	A number of chemical preparations. See CHEMISTRY-Index, KERMES Mineral, and REGULUS of Antimony.	
	<i>Aparine</i> (<i>Gallium aparine</i> , Lin.)	Goosegrass, or cleavers.	The leaves.	Aperient.		
	<i>Apium</i> (<i>A. graveol.</i> Lin.)	Smallage.	The roots, leaves, and seeds.	Carminative.	Diet-drinks.	
	<i>Aqua marina</i> .	Sea-water.		Cathartic and alterative.		
	<i>Aquæ minerales</i> .	Mineral waters.		Tonic and alterative.		
	<i>Aquæ sulphuræ</i> .	Sulphureous waters.		Alterative and anthelmintic.		
	<i>Argentina</i> (<i>Potentilla argentin.</i> Lin.)	Silverweed.	The leaves.	Corroborant.		
	<i>Argentum vivum</i> .	Quicksilver.		A most powerful alterant.	Several chemical preparations; see CHEMISTRY-Index. An ingredient in several other official preparations.	
					Aristo-	

(A) The Angustura bark was first imported from the West Indies in 1788; but it is a native of Africa. Mr Bruce, who had been cured of a dysentery in Abyssinia by the bark of a plant called there *Wooginos*, brought the seeds from that country, and the plant is now cultivated in Kew garden and other places under the name of *Brucea antidysenteria*, or *ferruginea*. He supposed the bark of this was the same with that of the Angustura; but Dr Duncan, in the Medical Commentaries for 1790, says that they are totally different when compared together. For an account of the Angustura bark, see *JESUIT'S BARK*.

TECHNICAL NAMES. ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
<i>Aristolochia</i> (<i>A. clematitis</i> , Lin.) Birthwort.	The roots.	Attenuating, stimulant, and detergent.	
<i>Armeniaca</i> (<i>Prunus Armeniaca</i> , Lin.) The plum-tree.	The fruit and gum.	The fruit refrigerant, and the gum demulcent.	
<i>Arnica</i> (<i>A. montana</i> , Lin.) German leopard's bane.	The herb, flowers, and roots.	Antispasmodic; emetic, cathartic.	A warm infusion.
<i>Arfenicum</i> . (B) Arsenic.		Corrosive.	
<i>Artemisia</i> (<i>A. vulgaris</i> , Lin.) Mugwort.	The leaves.	Antispasmodic.	Infusion.
<i>Arum</i> (<i>A. maculatum</i> , Lin.) Wake-robin.	The root.	Stimulant.	A compound powder and conserve (c).
<i>Asafetida</i> . See <i>Gummi</i> , infra.			
<i>Asarum</i> (<i>A. Europaeum</i> , Lin.) Asarabacca.	The leaves.	Errhine, cathartic, and emetic.	A compound powder (d)
<i>Asparagus</i> (<i>A. officinalis</i> , Lin.) Asparagus.	The roots.	Supposed diuretic, but uncertain.	
<i>Asperula</i> . Woodruff.	The flowers.	Attenuant and aperient.	

Asphodelus,

(B) This pernicious mineral has some time ago been introduced into medicine as a certain remedy for cancers; but Mr Justamond, who published a treatise on this subject two or three years ago, informs us, that even the most guarded use of it in the external way, while it produces the happiest effects in healing cancerous ulcers, yet occasions such disagreeable symptoms of the paralytic kind, that it cannot be persisted in. The latest trials in London are likewise said to confirm this account; notwithstanding which, however, the internal use of it has since gained ground in a variety of disorders, particularly in intermitting fevers, which are said to be readily cured by it sometimes after the bark and all other remedies had failed. A solution of the mineral is given by drops, from one sixteenth to a sixth part of a grain for a dose, largely diluted in a warm aqueous liquid. Dr Aikin recommends oil and milk as a certain remedy against this destructive poison. He quotes from Hoffman an instance where several persons of distinction had tasted food mixed with arsenic instead of sugar. All of them were seized with anxiety at the breast, pain at the stomach, tremor of the lips, and reachings. Milk and oil were given in great plenty, and they continued strongly vomiting for half a day. Some vomited no less than 100 times; but all of them recovered. Some instances of a similar kind have come within the Doctor's own knowledge. Sage in his Mineralogy relates, that the regulus is much less dangerous than the calx or glass: he says that on giving half an ounce to a cat, the animal only grew meagre for some time, but afterwards became fat again. He says that acids, particularly vinegar, are the antidotes to this poison; and that oils and emulsions do not so effectually obtund this poison as acids do. Of this he has had experience in brutes. He adds, that the regulus is not soluble in water, and that the founders are more afraid of fumes of lead than arsenic.

(c) Dr Aikin informs us, that the insupportable pungency on the tongue, which has hitherto prevented it from being used in a fresh state so as to exert its full virtues, is effectually covered by unctuous and gummy materials. The fresh root beaten into a smooth mass, with the addition of a little testaceous powder which promotes the division of it, may be either mixed with about an equal quantity of powdered gum arabic, and three or four times as much conserve, so as to make them into an electuary; or rubbed with a thick mixture of mucilage of gum arabic and spermaceti, gradually adding any suitable watery liquors, and a little syrup in order to form an emulsion, two parts of the root, two of gum, and one of spermaceti, make an emulsion, which scarce impresses any degree of pungency upon the tongue though kept long in the mouth. In these forms our author has given the fresh root from ten grains to more than a scruple, three or four times a-day: it generally occasioned a slight sensation of warmth, first about the stomach and then in the remoter parts; manifestly promoted perspiration, and frequently produced a plentiful sweat. Several obstinate rheumatic pains have been removed by the use of this preparation, which our author therefore recommends to further trial.

(d) The leaves of this plant are by some supposed to be more powerful than the roots as emetics and cathartics, but they are milder as errhines. Geoffroy relates, that a single dose of the errhine of which this root is an ingredient has occasioned a discharge for three days; and that he has known a palsy of the mouth and tongue cured by the same means. He recommends it in stubborn disorders of the head proceeding from viscid matters, in palsies, and lethargic distempers. During its operation the patient must carefully avoid cold, which is apt to produce pustules, inflammations, swellings of the face, and sometimes worse symptoms than even these. The empirical herb-snuffs have the leaves of asarum for their basis, but sometimes mixed with ingredients of a more dangerous nature.

TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
<i>Asphodelus</i> , (<i>A. Asphodel</i> , or king's <i>Asphodelus</i> , Lin.)	Asphodel, or king's spear.	The roots.	Emollient and suppurative.	
<i>Atriplex</i> (<i>Chenopodium vulvar</i> , Lin.)	Stinking orach.	The leaves.	Antispasmodic.	A spirituous tincture, decoction, or conserve, recommended by Tournefort and others.
<i>Avena fativa</i> (Lin.)	Oats.	The grain.	Emollient.	Decoction.
<i>Aura electrica</i> .	Electricity.		A violent stimulant.	
<i>Aurantium</i> (<i>Citrus aurant</i> , Lin.)	The orange.	The leaves, fruit, and flowers.	Cordial, stomachic, and refrigerant.	An essential oil, a distilled water, and a conserve.
<i>Auricula</i> (<i>Tremell. verruc</i> , Lin.)	Judæ, Jews-ears.	The whole.	Purgative, or astringent; uncertain.	
<i>Auripigmentum</i> .	Orpiment.		Corrosive, but less so than arsenic.	
<i>Axungia porcina</i> .	Hog's lard.		Emollient.	
<i>Axungia viperina</i> .	Viper's fat.			
<i>Balaustia</i> (<i>Punica granat</i> , Lin.)	Balaustine, or double-flowered pomegranate tree.	The flowers.	Astringent.	Ingredient in a powder.
<i>Balsamita</i> (<i>Tanacetum balsaminum</i> , Lin.)	Costmary.	The leaves.	Aromatic, antihysteria.	Distilled water and spirituous tincture.
<i>Balsamum Canadense</i> (<i>Pinus balsamea</i> , Lin.)	Balsam of Canada.	The resin.	Diuretic and tonic.	
<i>Balsamum Copayvæ</i> (<i>Copaifera officinalis</i> , Lin.)	Balsam of Copivi.	The resin.	Diuretic and tonic.	An empyreumatic oil, and an ingredient in some tinctures (E).
<i>Balsamum Gileadense</i> (<i>Amyris Gileadensis</i> , Lin.)	Opobalsam, or balm of Gilead.	The resin.	Said to be a most extraordinary vulnerary.	
<i>Balsamum Peruvianum</i> (<i>Myroxylon peruiferum</i> , Lin.)	Balsam of Peru.	The resin.	A fine warm aromatic.	An ingredient in many tinctures, and some ointments.
<i>Balsamum Tolutanum</i> (<i>Toluifera balsaminum</i> , Lin.)	Balsam of Tolu.	The resin.	Aromatic and corroborant.	An ingredient in several tinctures, elixirs, and a kind of pectoral pills.
<i>Bardana</i> major, (<i>Arctium lappa</i> , Lin.)	Burdock.	The roots and seeds.	Aperient, diuretic, and sudorific.	Decoction.
<i>Barytes</i> (F).				

Beccabunga.

(E) Balsam of Copivi has been employed empirically in hæmorrhoidal cases; and Dr Cullen informs us, that he has known it give relief in such cases, in doses from 20 to 40 drops once or twice a day, mixed with powdered sugar. Fuller recommends it in consumptions; but his practice is censured by Dr Fothergill in the 4th volume of London Medical Observations.

(F) *Barytes*. The solution of the aerated barytes, or terra ponderosa, in spirit of salt, has been found capable of producing powerful effects on the human system. Several trials of it were made in the year 1789 by Dr Crawford, in St Thomas's hospital; and it was found to be very efficacious in serophulous complaints.—In some cases of swelled glands, foul ulcers, enlarged joints, and general cachexy, singular relief was given by the muriated barytes, either alone or joined with mercurials, antimonials, and the bark. The medicine in a few cases appeared to augment the cuticular secretion; in most it occasioned an uncommon flow of urine, and almost universally improved the appetite and general health of the body. Few stomachs, however, could bear more than from six to ten drops of a saturated solution, nor did a continued use of the medicine reconcile the stomach to it, but rather the contrary. Sometimes it produced a vertigo, which probably arose from its nauseating quality. Dr Crawford is of opinion, that this solution, when injudiciously managed, is capable of producing deleterious effects, by disordering the nervous system, and bringing on violent vomiting and purging. From some experiments made upon dogs, it appears that a large dose would prove fatal.

TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Beccabunga (<i>Veronica beccabunga</i> , Lin.)	Brooklime.	The herb.	Attenuating, and antiscorbutic.	
Bechen album, (<i>Centaurea bechen</i> , Lin.)		The root.	Stimulant.	
Bechen rubrum, (<i>Statice limon</i> , Lin.)		The root.	Stimulant.	
Belladonna (<i>Atropa belladonna</i> , Lin.)	Deadly nightshade.	The juice.	Narcotic.	An extract of the juice, decoction, infusion, powders.
Bellis minor, (<i>Bell. peren</i> , Lin.)	Common daisy.	The leaves.	Attenuant.	
Benzöe, (<i>Terminalia benzoin</i> , Lin.)	Benzoin.	The resin.	Pectoral.	Ingredient in the paregoric elixir.
Berberis (<i>Berber. vulgar</i> , Lin.)	Barberry.	The bark and fruit.	Astringent.	A jelly.
Beta, (<i>B. vulgaris</i> , Lin.)	The beet.	The root and leaves.	Cathartic and em- rhine.	
Betonica (<i>B. officinalis</i> , Lin.)	Betony.	The leaves and flowers.	Corroborant.	
Betula (<i>B. alba</i> , Lin.)	The birch-tree.	The bark and sap.	Antiscorbutic and diuretic.	
Bezoar.	Bezoar-stone.		Many virtues falsely ascribed to it; now found to be only an absorbent.	
Bilis animalis.	The gall or bile of animals.		Cathartic.	
Bistorta (<i>Polygonum bistorta</i> , Lin.)	Bistort or snake-wort.	The roots.	Powerfully astringent.	An ingredient in a powder.
Boli.	Boles.		Astringent and slightly absorbent.	Ingredients in several powders.
Bonus Henricus, (<i>Chenopodium bonus Hen.</i> , Lin.)	English mercury, all-good, or good Henry.	The leaves.	Laxative.	
Borax.	Tincal, or borax.	The whole.	Diuretic and emmenagogue.	An ingredient in a powder, and a salt prepared from it. See CHEMISTRY-Index.
Branca ursina, (<i>Acanthus mollis</i> , Lin.)	Bear's-breech.	The root.	Emollient.	
Brassica, (<i>B. oleracea</i> , Lin.)	Cabbage.	The leaves.	Refrigerant and laxative.	
Brassica marina, (<i>Convolvulus soldanella</i> , Lin.)	Sea-coleworts, or soldanella.	The leaves.	A strong cathartic.	Now rejected from practice.
Brucea antidysenterica. See note (A), <i>supra</i> .				
Bryonia (<i>B. alba</i> , Lin.)	White briony.	The root.	Discutient and violently cathartic.	
Bursa pastoris, (<i>Thlaspi bursa p.</i> , Lin.)	Shepherd's purse.	The leaves.	Astringent, but very doubtful.	
Cacao (<i>Theobroma cacao</i> , Lin.)	Chocolate tree.	The fruit.	Analeptic.	Chocolate.
Cajeput (<i>Maleleuca leucadendron</i> , Lin.)	Cajeput.	The fruit.	Stimulant, healing, carminative.	Distilled oil.

MATERIA MEDICA.

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Simples.

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Simples.

TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Calaminaris lapis.	Calamine stone.		Desiccative, heal- ing.	An ingredient in collyria, epulotic cerate, &c.
Calamintha (<i>Melissa calamintha</i> , Lin.)	Calamint.	The leaves.	Aromatic and sti- mulant.	
Calamus aromaticus (<i>acorus calamus</i> , Lin.)	Sweet-flag.	The roots.	Aromatic and sto- machic.	
Calendula (<i>C. officinalis</i> , Lin.)	Garden marigold.	The flowers.	Attenuating and fu- dorific, but very doubtful.	
Calx viva.	Quicklime.		A violent corrosive, and powerful al- terant and absor- bent.	A medicated water.
Camphor (<i>Laurus camphora</i> , Lin.)	Camphire tree.	The concreted es- sential oil.	Refrigerant and di- aphoretic, stimu- lant, antispasmo- dic.	A solution in rectified spirit, in expressed and essential oils. Ingredient in many other compositions.
Canella alba (Lin.)	White cinnamon.	The bark.	Aromatic and sti- mulating.	An ingredient in several tinc- tures.
Cannabis (<i>C. sativa</i> , Lin.)	Hemp.	The seeds.	Aperient and re- frigerant, but doubtful.	Decoctions and infusions.
Cantharis (<i>Meloe vesicatorius</i> , Lin.)	Spanish fly.		Violently stimula- ting and vesica- tory.	A spirituous tincture, a pla- ster, ointment, &c.
Caparis (<i>C. spinosa</i> , Lin.)	Caper-bush.	The bark of the root, and flower- buds.	Aperient and sto- machic.	Pickled.
Cardamines (<i>C. pratensis</i> , Lin.)	Cardamine.	The flowers.	Antispasmodic.	Powder.
Cardamomum majus (<i>Amom. cardam.</i> Lin.)	Greater cardamom.	The seeds.	Aromatic and sti- mulant.	} A spirituous water and tincture. Ingredient also in several officinal com- positions.
Cardamomum minus (<i>Amom. re- pens</i> , Lin.)	Lesser cardamom.	The seeds.	Aromatic and sti- mulant.	
Cardiaca (<i>Leonurus cardiaca</i> , Lin.)	Mother-wort.	The leaves.	Antispasmodic.	
Carduus benedictus (<i>Centaurea bene- dicta</i> , Lin.)	Blessed-thistle.	The leaves and seed.	Stomachic.	An ingredient in a stomachic tincture. Infusions.
Carica (<i>Ficus carica</i> , Lin.)	The fig.	The dried fruit.	Emollient, suppu- rative.	Ingredient in the pectoral decoction and lenitive elec- tuary.
Carlina (<i>C. acaulis</i> , Lin.)	Carlina-thistle.	The root.	Diaphoretic.	
Carpobalsam (<i>Amyris Gileadensis</i> , Lin.)	Carpobalsam.	The fruit.	Aromatic.	In substance applied warm as a cataplasm.
Carthamus (<i>C. tinctorius</i> , Lin.)	Bastard saffron.	The seeds.	Cathartic.	
Carvi (<i>Carum carvi</i> , Lin.)	Caraway.	The seeds.	Aromatic.	An essential oil, a spirituous water. Ingredient also in some officinal compositions.
Caryophylla rubra (<i>Dianthus caryoph.</i> Lin.)	Clove july-flower.	The flowers.	Cardiac and alexi- pharmac.	A syrup.

List of Simples.				PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	List of Simples.
	TECHNICAL NAMES.	ENGLISH NAMES.					
	Caryophyllata, (<i>Geum urban.</i> Lin.)	Avens, or herb benet.		The root.	Aromatic.	An essential oil.	
	Caryophyllum (<i>C.</i> <i>aromaticus</i> , Lin.)	The clove-tree.		The flower-cups.	Strongly aromatic.	An essential oil. Ingredient also in many officinal com- positions	
	Cascarilla (<i>Croton</i> <i>casca</i> , Lin. <i>Cro-</i> <i>ton eleutheria</i> , Swartz Prodr.	Cascarilla.		The bark.	Aromatic and sti- mulant.	Infusions.	
	Cassia fistularis (<i>C.</i> <i>fistula</i> , Lin.)	Cassia.		The fruit.	Purgative.	An ingredient in two electua- ries.	
	Cassia lignea (<i>Lau-</i> <i>rus cassia</i> , Lin.)	Cassia.		The bark and flower-buds.	Aromatic.	The basis of a distilled water.	
	Cassumunar.	Cassumar.		The root.	Stomachic and car- minative.		
	Castoreum (<i>Castor</i> <i>fiber</i> , Lin.)	Castor.			Nervine and anti- spasmodic.	A simple water; a spirituous water; a tincture. In- gredient in several officinal compositions.	
	Catechu (<i>Mimosa</i> <i>catechu</i> , Lin.)	Catechu, <i>vulgo</i> Ja- pan earth.			Astringent.	A tincture, troches, and con- fection, and an ingredient in several officinal compo- sitions.	
	Celeri (<i>Apium gra-</i> <i>veolens</i> , Lin.)	Celery.		The leaves.	Laxative.		
	Centaurium majus (<i>Centaureacentau-</i> <i>rium</i> , Lin.)	Greater centaury.		The root.	Astringent, aper- ient, and vulne- rary.		
	Centaurium minus (<i>Gentianacentaur.</i> Lin.)	Lesser centaury.		The tops.	Stomachic.	Tincture and infusion.	
	Cepa (<i>Allium cepa</i> , Lin.)	The onion.		The root.	Attenuating and diuretic.		
	Cera alba.	White wax.			Emollient.	Ingredient in many plasters and ointments.	
	Cera flava.	Yellow wax.			Emollient.	Ingredient in almost all oint- ments.	
	Cerasus (<i>Prunus ce-</i> <i>rasus</i> , Lin.)	The cherry tree.		The fruit and gum.	Refrigerant; the gum partaking of the properties of gum-arabic.		
	Cerefolium (<i>Sandix</i> <i>cerefol.</i> Lin.)	Chervil.		The juice.	Aperient and diu- retic.		
	Ceterach (<i>Asplen. ce-</i> <i>terach.</i> Lin.)	Spleenwort.		The leaves.	Diuretic (G).		
	Cevadilla (<i>Veratrum</i> <i>album</i> , Lin. ?)	Indian caustic bar- ley.		The seeds.	Virulently cauf- tic, (H).		
	Chamædrys (<i>Teu-</i> <i>crium chamædr.</i> Lin.)	Germander.		The leaves and tops with the seed.	Sudorific, diuretic, &c.		

Chamæmelura

(G) M. Morand relates, that these leaves have lately been discovered to have an admirable diuretic virtue; that they were used with great success by Count d'Auteuil, a Spanish naval commander, for the gravel, with which he was violently tormented; and since that time they have come greatly into use at Paris, Verdun, and Grenoble. From observations made in those places it appears, that they carry off sand, cleanse the kidneys, and mitigate pains in the urinary passages; that the method of using them is to drink infusions of the leaves in the morning at tea, adding such other medicines as may be judged proper.

(H) These seeds appear to be the strongest of all vegetable caustics. Monardes relates, that in putrid ver-
minous

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TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Chamæmelum (<i>Anthem. nobilis</i> , Lin.)	Camomile.	The single flowers.	Stomachic, carminative, and emollient.	An essential oil, a simple water, an extract, a decoction.
Chamæpithys (<i>Tenacrium chamæpit.</i> Lin.)	Ground-pine.	The leaves.	Aperient and vulnerary.	
Cheiri, seu Leucolumluteum (<i>Cheiranthcheiri</i> , Lin.)	Wallflower.	The flower.	Aperient, cordial, and attenuant.	
Chelæ crancrorum.	Crab's claws.		Absorbent.	Levigated.
Chelidonium majus, (Lin.)	Common celandine.	The leaves and roots.	Stimulating, diuretic, and sudorific.	Infusion. Dried root powdered.
Chelidonium minus (<i>Ranunculus ficaria</i> , Lin.)	Pilewort.	The leaves and root.	Emollient.	
China (<i>Smilax China</i> , Lin.)	China.	The root.	Diaphoretic and diuretic.	
Cicer (<i>C. arietin.</i> Lin.)	Red chices, or chick peas.	The seeds.	Lithontriptic and diuretic, but very doubtful.	
Cichorium (<i>C. intyb.</i> Lin.)	Wild succory.	The roots and leaves.	Laxative and antiscorbutic.	
Cicuta major (<i>C. maculat.</i> Lin.)	Hemlock (1).	The leaves and seeds.	Resolvent and alterant.	Inspissated juice of the leaves, and an extract from the seeds.

4 O 2

Cinara

minous ulcers and gangrenes, they have the same effects as corrosive sublimate, or the actual cautery; and that the way of using them is to sprinkle a little of powdered seed upon the part; or, for the greater safety, to dilute it with watery liquors, and apply lint dipped in the mixture. In the *Amanitates Academicæ* of Linæus, they are said to be the most powerful of all medicines for destroying cutaneous insects in children.

(1) It is supposed that the juice of this plant was the poison so much used among the Athenians for putting criminals to death; but from some late experiments this seems to be doubtful; or at least that the remedy is very easy. Mr Haram, apothecary at Chartres, informs us, that a large spoonful of the juice given to a cat had no sensible effect; a second produced a visible *embarras* on the region of the reins: in a little time the animal staggered, but did not fall. A quarter of an hour after, she was found stretched out motionless, with her paws rigid. Half a drachm of theriaca, with two large spoonfuls of wine, were given without effect: but no sooner was a large spoonful of lemon-juice swallowed than she got up as if nothing had happened, and continued afterwards in good health. Other authors likewise inform us, that vinegar is an antidote against the poisonous effects of this plant.

With regard to its medical virtues, Dr Monro, who has seen it tried in a great number of cases, informs us, that he never saw it cure a confirmed cancer, whether ulcerated or not; that in a few cases of ulcerated cancers it mended the discharge, and changed it from a thin ichor to an appearance of laudable pus; but, notwithstanding this favourable appearance, the distemper at last terminated fatally.—In scrophulous cases, some few small tumours were thought to be dissolved by it; but large hard swellings were never removed by it, tho' the remedy was continued for weeks and months. The discharge from scrophulous sores of the extremities, however, was often mended by it; and in many cases, it was found to be of more service when joined with the bark than when given alone: the action of the bark and mercury was thought to be rendered more powerful by it. In the chincough it did not produce any remarkable effects. In some few instances, he imagined that it hurt the health of the patients; and in one or two, that it hastened death. In this last case, indeed, the use of the cicuta had been laid aside for some time, and the patients sunk so gradually, that our author was in doubt what might have been the cause of their death.

The roots of hemlock have been supposed to be more active than the leaves, both when taken internally and when outwardly applied. Dr Stork relates, that on being cut, it yields a bitter acrid milk, of which a drop or two applied to the tip of the tongue occasioned a rigidity, pain, and swelling of the part, so as to deprive him of the power of speech. These symptoms, however, disappeared on washing the part with citron juice. When dried, it loses its virulence; so that Dr Stork says, he has taken a grain or two of the powder without injury. Other authors give instances where 20 and 30 grains have been given with good effect in schirrosities of the liver, quartan agues, on the approach of a fit, and even in acute fevers. Dr Aikin informs us, that the fresh root seems not to be at all times of equal virulence; and that he has seen it chewed freely without

List of Simples.	TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	List of Simples.
	Cinara (<i>Cynara scolymus</i> , Lin.)	Artichoke.	The leaves.	Diuretic (κ).		
	Cinnamomum (<i>Laurus cinnam.</i> Lin.)	The cinnamon tree.	The bark.	Aromatic and corroborant.	An essential oil, a simple and spirituous distilled water, and an ingredient in a great number of compositions.	
	Citrullus (<i>Cucurbita citrullus</i> , Lin.)	Citruls.	The seeds.	Refrigerant.		
	Coccinella (<i>Coccus cacti</i> , Lin.)	Cochineal.	.	Sudorific, but chiefly used for colouring.		
	Cocculus Indicus, (<i>Menisperm. coccul.</i> Lin.)	Indian berry.	The fruit.	Narcotic.		
	Cochlearia (<i>C. officinalis</i> , Lin.)	Scurvy-grass.	The leaves.	Stimulating and attenuant.	A conserve and spirit. An ingredient in some other official preparations.	
	Coffea (<i>C. Arabica</i> , Lin.)	The coffee-tree.	The fruit.	Stomachic and corroborant.	A decoction.	
	Colchicum (<i>C. autumnale</i> , Lin.)	Meadow saffron.	The root.	Diuretic.	A syrup and oxymel.	
	Colocynthis (<i>Cucumis colocynthis</i> , Lin.)	Coloquintida, or bitter-apple.	The medullary part of the dried fruit.	Violently cathartic.	An ingredient in some cathartic pills and extracts.	
	Columbo (<i>Ignatia amara</i> , Lin.)	Columbo, or Colomba.	The root.	A most excellent antiseptic and stomachic.	A vinous tincture.	
	Coneffi (<i>Nerium antidysentericum</i> , Lin.)	Coneffi.	The bark.	Antiseptic and tonic (λ).		
	Consolida major, (<i>Symphitum officin.</i> Lin.)	Comfrey.	The root.	Emollient.		

Contrayerva

without any other effect than that sweetishness observable in parsley roots or carrots. There are likewise instances, where the cicuta roots have been taken to the quantity of some drachms, or even ounces, without any bad consequence.

The seeds have been recommended as demulcent, paretic, and antaphrodisiac; but little more (according to Dr Aikin) is yet known about them, but that they are innocent to some birds. Mr Ray says, that he found the crop of a thrush full of them, and that at a season when the corn was in full growth.

In the first volume of the Medical Commentaries, an extract prepared from hemlock-seeds is preferred to that made from the leaves; and in the last Edinburgh Pharmacopœia, an extract of this kind is ordered as an official.

(κ) Dr Aikin informs us, that the expressed juice of the leaves has sometimes proved successful in dropsies, when other remedies had failed. For this purpose it is not depurated, but only freed by passing through a strainer from the grosser feculencies, and mixed with an equal quantity of white wine; three or four spoonfuls to be taken every morning and evening.—The following decoction (as we are informed by Dr Monro) was long kept a secret by a person at Andover, and is said to have carried off the water from several people labouring under a dropsy. Take of artichoke leaves and stalks three handfuls; of bruised juniper-berries one quart; of scraped horse-raddish one handful; of green fir-tops two handfuls; of bruised white mustard-seed two table-spoonfuls; mix the whole, and boil them in two gallons of water to one, and strain the whole thro' a cloth. Half a pint to be taken by a grown person morning and evening, adding a little syrup or sugar to make it agreeable.

(λ) This bark is reckoned a specific in diarrhœas; the fine powder being made use of in an electuary formed with syrup of oranges, and given to the quantity of half a drachm or more four times a day, after a vomit has been given. The first day it is taken, the number of stools is generally increased, without any increase of the griping; the second, the colour of the stools is meliorated; and, on the third or fourth, the consistence approaches to the natural, when it makes a cure. It seldom fails in curing a recent diarrhœa, proceeding from irregularities in diet without fever; and it is frequently of service in habitual diarrhœas.

List of Simples.	TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	List of Simples.
	Contrayerva (<i>Dorstenia contrayerva</i> , Lin.)	Contrayerva.	The root.	Aromatic and dia- phoretic.	Spirituos tincture, extract, powder.	
	Convallaria (<i>C. Polygonatum</i> , Lin.)	Solomon's seal.	The root.	Suppurative.	Poultice, decoction in milk recommended in some cases of hemorrhagy.	
	Corallina (<i>Sertularia</i> , Lin.)	Coralline.		Absorbent.		
	Coriandrum (<i>C. sativum</i> , Lin.)	Coriander.	The seeds.	Carminative and stomachic.	Formerly an ingredient in some officinal compositions.	
	Cornu cervi (<i>Cervus elephas</i> , Lin.)	Hartshorn.		Emollient and nu- tritious.	Shavings, a jelly, a volatile al- kaline salt and spirit, and an empyreumatic oil.	
	Costus (<i>C. Arab.</i> Lin.)	Costus.	The root.	Attenuant and diu- retic.		
	Crassula (<i>Sedum telephium</i> , Lin.)	Lesser orpine.	The leaves.	Emollient and as- tringent.		
	Creta alba.	White chalk.		Absorbent.		
	Crithmum (<i>C. maritimum</i> , Lin.)	Samphire.	The leaves.	Aperient, stoma- chic, and diu- retic.		
	Crocus (<i>C. sativus offic.</i> Lin.)	Saffron.	The chives, or fleshy capilla- ments growing at the end of the flower.	Aromatic and cor- dial.	A spirituous tincture; a sy- rup; and an ingredient in several officinal composi- tions.	
	Croton. See <i>Cassia</i> supra.					
	Cubebæ (<i>Piper cubeba</i> , Lin.)	Cubebs.	The fruit.	Aromatic and sti- mulant.	An ingredient in several offi- cinal compositions.	
	Cucumis hortenſis (<i>C. sativus</i> , Lin.)	The garden cucum- ber.	The seeds.	Refrigerant.		
	Cucumis agrestis (<i>Momordica elaterium</i> , Lin.)	Wild cucumber.	The fruit.	Violently cathartic.	The juice inspissated.	
	Cucurbita (<i>C. pepo</i> , Lin.)	The gourd and pompion.	The seeds.	Refrigerating.	An expressed oil.	
	Cuminum (<i>C. cyminum</i> , Lin.)	Cummin.	The seed.	Aromatic, stimu- lant.	An essential oil by distilla- tion; and giving name to a plaster and cataplasim.	
	Cupressus.	The cypress.	The fruit.	A strong astrin- gent.		
	Cuprum.	Copper.		A violent emetic, diuretic, and al- terative.	Calcined, and producing salts by combination with sever- al acids, and with volatile alkali. See CHEMISTRY, Index.	
	Curcuma (<i>C. longa</i> , Lin.)	Turmeric.	The root.	Aromatic, aper- ient, and emme- nagogue.		
	Cuscuta (<i>Gentiana purpurea</i> , Lin.)		The root.	Stomachic.		
	Cydonium (<i>Pirus cydonia</i> , Lin.)	The quince.	The fruit and seeds.	Stomachic and cor- roborative.	A syrup and jelly of the fruit, and mucilage of the seeds.	
	Cyminum. See <i>Cuminum</i> , supra.					
	Cynoglossus (<i>C. officinalis</i> , Lin.)	Hound's tongue.	The root.	Narcotic, but doubtful.		
	Cynosbatum (<i>Rosa canina</i> , Lin.)	The wild briar, dog-rose, or hip-tree.	The fruit and flow- ers.	Refrigerant and antiscorbutic.	A distilled water and conserve.	

Cyperus

List of
Simples.List of
Simples.

TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Cyperus (<i>C. longus</i> , Lin.)	Long cyperus.	The root.	Aromatic and car- minative.	
Dactylus (<i>Phoenix</i> <i>dactylif.</i> Lin.)	The date-tree.	The fruit.	Emollient and slightly astring- ent.	
Daucus Creticus (<i>Athamanta Gre-</i> <i>tenfis</i> , Lin.)	Candy carrot.	The seeds.	Aromatic.	Ingredient in mithridate and theriaca.
Daucus fativus (<i>D.</i> <i>carota</i> , Lin.)	The garden carrot.	The roots.	Powerfully anti- septic.	A poultice from them for can- cers, and a marmalade.
Daucus silvestris (<i>D. carota</i> , Lin.)	Wild carrot.	The seeds.	Aromatic.	
Dens leonis (<i>Leon-</i> <i>todon. tarax.</i> Lin.)	Dandelion.	The root and herb.	Attenuant, but doubtful.	
Dictamnus Creti- cus (<i>Origanum</i> <i>dictamnus</i> , Lin.)	Dittany of Crete.	The leaves.	Aromatic.	An essential oil; and ingre- dient in several officinal powders.
Dictamnus albus (Lin.)	Bastard dittany.	The root.	Alexipharmac, to- nic, and anthel- mintic.	
Digitalis (<i>D. pur-</i> <i>purea</i> , Lin.)	Fox-glove.	The leaves.	Emetic, cathartic, and diuretic.	The leaves in powder or in- fusion, used in dropsies.
Dolichos (<i>D. pru-</i> <i>riens</i> , Lin.)	Couhage, or co- witch.	The hairy matter of the pods.	Anthelmintic.	
Doronicum. See <i>Arnica</i> .				
Dulcamara (<i>Sola-</i> <i>num dulcamara</i> , Lin.)	Bitter-sweet, or woody night- shade.	The herb and root.	Diaphoretic, atte- nuant, and ca- thartic.	Watery infusions.
Ebulus (<i>Sambucus</i> <i>ebulus</i> , Lin.)	Dwarf-elder, or Danewort.	The root, bark, leaves, and fruit.	Strongly cathartic.	A rob from the berries.
Elaterium. See <i>Cucumis</i> .				
Elatine (<i>Veronica</i> <i>officinalis</i> , Lin.)	Fluellin, or female speedwell.	The leaves.	Diuretic and atte- nuant.	Gives name to one of the offi- cinal honeys.
Elcampane. See <i>Enula</i> .				
Elemi (<i>Amyris ele-</i> <i>mifera</i> , Lin.)	Gum elemi.		Aromatic.	Gives name to an ointment.
Eleutheria. See <i>Cascarilla</i> .				
Endivia (<i>Cichoreum</i> <i>endivia</i> , Lin.)	Endive.	The leaves and roots.	Aperient and refri- gerant.	
Enula (<i>Inula hel-</i> <i>lenium</i> , Lin.)	Elecampane.	The root.	Expectorant, sto- machic, attenu- ating, and to- nic.	Spirituos and watery ex- tracts. A confection.
Eruca (<i>Sisymbrium</i> <i>amphibium</i> , Lin.)	Rocket.	The seeds.	Stimulant.	
Eryngium (<i>E. ma-</i> <i>ritim</i> , Lin.)	Eryngo, or sea- holly.	The root.	Aperient and diu- retic.	
Erysimum (<i>E. offi-</i> <i>cinale</i> , Lin.)	Hedge-mustard.	The recent plant.	Attenuant and diu- retic.	
Eupatorium cana- binum, (Lin.)	Hemp-agrimony. water-agrimony, or water-hemp.	The leaves.	Attenuant, corro- borant, and an- tiscorbutic.	
Euphorbium (<i>Eu-</i> <i>phorbia officinalis</i> , Lin.)	Euphorbium.		Sternutatory.	Powder.

TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Faba Indica, seu Sancti Ignatii, (<i>Ignatia amara</i> , Lin.)	St Ignatius's bean.	The seeds; (the root, the co- lumbo.)	Antispasmodic.	
Faba vicia (<i>Vicia faba</i> , Lin.)	The garden-bean.	The seeds and flow- ers.	Nutritive and cof- metic.	A distilled water from the flowers.
Fagopyrum (<i>Po- lyg. fagopyr.</i> Lin.)	Snakeweed.	The seeds.	Refrigerant.	
Farina tritici vel avenæ.	Bran.		Discutient.	
Ferrum.	Iron.		Corroborative and alterant.	Infusions in wine; the metal reduced to a calx by rust, or by fire, and some salts produced from it by com- binations with different a- cids. See CHEMISTRY In- dex.
Ficus. See <i>Carica</i> .				
Filipendula (<i>Spiræa filipend.</i> Lin.)	Common dropwort.	The root.	Astringent and cor- roborant.	
Filix (<i>Polypodium filix mas</i> , Lin.)	The male fern.	The leaves and root.	Anthelmintic and deobstruent.	Powder.
Flammula Jovis (<i>Cle- matis flammula</i> , Lin.)	Upright virgin's- bower.	The leaves and flowers.	Very acrid.	Powder for sprinkling on can- cerous and venereal ulcers; infusion and extract for in- ternal use, in wastings, &c. from lues venerea.
Fœniculum dulce et vulgare (<i>Anethum fanic.</i> Lin.)	Sweet and common fennel.	The seeds, roots, and leaves.	Aromatic, stimu- lant, and carmi- native.	A simple water; and an in- gredient in one or two compositions.
Fœniculum aquati- cum (<i>Phellandri- um aquat.</i> Lin.)	Waterwort.	The leaves and seeds.	Corroborant.	
Fœnum Græcum (<i>Trigonella fœnum- græcum</i> , Lin.)	Fenugreek.	The seeds.	Emollient.	Chiefly used in cataplasms, fomentations, emollient gly- sters, &c.
Formica (<i>F. rufa</i> , Lin.)	The ant.	The whole insect.	Stimulant.	An oil and acid spirit.
Fragaria (<i>F. vesca</i> , Lin.)	The strawberry bush.	The leaves and fruit.	Astringent, corro- borant, and refri- gerant.	
Frangula (<i>Alnus ni- gra</i> , Lin.)	Black alder.	The bark.	Violently cathartic.	
Fraxinella (<i>Diham- nus albus</i> , Lin.)	White or bastard dittany.	The root.	Diaphoretic.	
Fraxinus (<i>F. excel- sior</i> , Lin.)	The ash-tree.	The bark and seeds.	Astringent and sti- mulant.	
Fuligo ligni splen- dens	Shining woodfoot.		Antispasmodic.	A spirituous tincture.
Fumaria (<i>F. officina- lis</i> , Lin.)	Fumitory.	The leaves.	Stimulating, atte- nuant, and an- tiscorbutic.	
Fungus melitenfis (<i>Cynomorium coc- cin.</i> Lin.)		The stems and tops.	Tonic and astring- ent.	Decoction and tincture.
Galanga minor (<i>Kempferia Galan- gal</i> , Lin.)	Galangal.	The root.	Stomachic.	
Galbanum (<i>Bubon galbanum</i> , Lin.)	Galbanum.	The gum.	Antihysteric.	An ingredient in several offi- cinal compositions.

TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Galega (<i>G. officinalis</i> , Lin.)	Goat's rue.	The herb.	Diaphoretic, but very doubtful.	
Gallæ (<i>ex Querc. cerr.</i> Lin.)	Galls.		Astringent (M).	
Gallium luteum (<i>G. verum</i> , Lin.)	Yellow ladies bed- straw, or cheese- rennet.	The tops.	Astringent.	
Gambogia. See <i>Gummi gambogia</i> , infra.				
Genista (<i>Spartium scoparium</i> , Lin.)	Broom.	The leaves, flowers, and feeds.	Diuretic and ca- thartic.	
Gentiana (<i>G. lutea</i> , Lin.)	Common gentian.	The root.	Stomachic and sti- mulant.	A spirituous tincture, and an ingredient in many officinal compositions.
Geoffræa (<i>G. inermis</i> , Lin.)	Cabbage-bark, or worm-bark tree.	The bark.	Anthelmintic and purgative.	Powder, decoction, syrup, ex- tract.
Geranium Robertianum (Lin.)	Herb Robert.	The leaves.	Astringent, but very doubtful.	
Ginseng (<i>Panax quinquefol.</i> Lin.)	Ginseng.	The root.	Stimulant and cor- roborant.	
Gladiolum luteum (<i>Iris pseudacorus</i> , Lin.)	Yellow water-flag, bastard acorus, or water flower-de- luce.	The roots.	Strongly cathartic.	
Glycyrrhiza (<i>G. glabra</i> , Lin.)	Liquorice.	The root.	Emollient and pec- toral.	An extract and powder. An ingredient in many officinal compositions.
Gramen caninum (<i>Triticum repens</i> , Lin.)	Quick-grass.	The roots.	Aperient.	
Grana paradisi (<i>Momum gr. par.</i> Lin.)	Grains of paradise.	The seeds.	Aromatic and sti- mulant.	
Granatum (<i>Punica granatum</i> , Lin.)	The pomegranate.	The fruit and flowers.	Refrigerant and astringent.	
Gratiola (<i>G. officinalis</i> , Lin.)	Hedge-hyssop.	The herb.	Emetic and cathar- tic.	
Guajacum (<i>G. officinale</i> , Lin.)	Lignum-vitæ, or guajacum.	The wood and bark.	Aperient, stimu- lant, and cor- roborative.	An extract, two tinctures, and a gummy resin. An ingredient in many officinal preparations.
Gummi arabicum (<i>Mimosa nilotica</i> , Lin.)	Gum-arabic.		Astringent and mu- cilaginous.	An ingredient in a great num- ber of officinal compo- sitions.
Gum ammoniacum (<i>Ferula meoides</i> , Lin. ?)	Gum-ammoniac.		Aperient, antispas- modic, and emol- lient.	A solution. An ingredient in several pectoral compo- sitions.
Gum. asafœtida (<i>Ferula asaf.</i> Lin.)	Asafœtida.	The concrete juice.	Antihysterican- thelmintic.	Tinctures.
Gum. bdellium.	Bdellium.		Sudorific, diuretic, and emollient.	
Gum. benzoin (<i>Terminalia benzoin</i> , Lin. <i>Styrax benzœ</i> , Lond. Ph. Transf.) Nº 197.	Benzoin.		Cosmetic.	An ingredient in several ano- dyne compositions.

Gum.

(M) Dr Cullen informs us, that an ointment composed of one part of powdered galls and eight of hog-lard is a common remedy for the hæmorrhoids, and has been found efficacious.

MATERIA MEDICA.

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TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Gum. elemi (<i>Amyris elemifera</i> , Lin.)	Elemi.		Aromatic.	An essential oil, and gives name to ointment.
Gum. galbanum, (<i>Bubon galb.</i> Lin.)	Galbanum.		Antispasmodic.	An ingredient in many antihysterical medicines.
Gum. gambogia (<i>Gambogia gutta</i> , Lin. <i>Stalagmites gambogioides</i> , Murray)	Gamboge.		Emetic and cathartic.	Gives name to a certain kind of pills.
Gum. kino.	Kino.		Astringent.	A tincture.
Gum. labdanum (<i>Cistus ladanifera</i> , Lin.)	Labdanum.		Stomachic.	An ingredient in the stomachic pills and plasters.
Gum. lacca (<i>Coccus lacca</i> , Lin. habitans in <i>Ficus religiosa</i> , in <i>Mimosa cineraria</i> , & aliis.)	Gum lac.		Astringent.	A tincture.
Gum. mastic, (<i>Pinus lentiscus</i> , Lin.)	Mastich.		Corroborant.	
Gum. myrrha.	Myrrh.		Antispasmodic and corroborant.	A tincture, and an ingredient in many official compositions.
Gummi olibanum, (<i>Juniperus Lycia</i> , Lin.)	Olibanum.		Astringent, but uncertain.	An ingredient in some powders, and other official compositions.
Gummi opoponax (<i>Psoralea opoponax</i> , Lin.)	Opoponax.		Attenuant and stimulant.	An ingredient in some official compositions.
Gum. sanguis draconis. Vid. Sanguis, infra.				
Gum. Senegal (<i>Mimosa Seneg.</i> Lin.)			Astringent and mucilaginous.	
Gum. styrax. See <i>Styrax</i> , infra.				
Gum. thus. See <i>Thus</i> , infra.				
Gum. tragacanth (<i>Astragalus trag.</i> Lin.)	Gum tragacanth, commonly gum-dragon.		Astringent and corroborant.	
Hæmatites.	Blood-stone.		Astringent and corroborative.	
Hedera arborea (<i>Hedera helix</i> , Lin.)	Ivy.	The leaves, berries, and resin.	Diaphoretic.	
Hedera terrestris, (<i>Glechoma hederacea</i> , Lin.)	Ground-ivy.	The leaves.	Aperient and corroborant.	
Helenium. See <i>E-nula</i> , supra.				
Helleboraster (<i>Fætidus</i> , Lin.)	Bear's foot.	The leaves.	Emetic, purgative, and anthelmintic.	Syrup.
Helleborus albus, (<i>Veratrum alb.</i> Lin.)	White hellebore.	The root.	Most violently emetic and errhine.	A tincture and honey, formerly.
Helleborus niger (<i>Lin.</i>)	Black hellebore, or Melampodium.	The root.	A powerful alterative and emmenagogue.	A tincture and extract.

List of Simples.	TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	List of Simples.
	Hepatica nobilis (<i>Anemone hepatic.</i> Lin.)	Noble liverwort.	The leaves.	Cooling and corro- borant.		
	Hermodactylus, (<i>Iris tuberosa</i> , Lin.)	Hermodactyl.	The root.	Purgative, but doubtful.		
	Herniaria (<i>H. gla- bra</i> , Lin.)	Rupture-wort.	The leaves.	Astringent.		
	Hippocastanum (<i>Æscul. hippocast.</i> Lin.)	Horfe-chefnut.	The bark and fruit.	Corroborant and errhine.		
	Hordeum (<i>H. disti- chon</i> , Lin.)	Barley.		Refrigerant.	A decoction.	
	Horminum (<i>Salvia horminum</i> , Lin.)	Garden-clary.	The leaves and seeds.	Corroborative.		
	Hydrargyrus. See <i>Argentum vivum</i> , supra.					
	Hydrolapathum (<i>Rumex aquati- cus</i> , Lin.)	Great water-dock.	The leaves and roots.	Alterant and laxa- tive.		
	Hyosciamus (<i>H. niger</i> , Lin.)	The common wild or black hen-bane.	The leaves and seeds.	Narcotic.	Cataplasms, plaster, powder, ointment.	
	Hypericum (<i>H. perforatum</i> , Lin.)	St John's wort.	The leaves, flowers, and seeds.	Diuretic, sudorific, and alterant.	Gives name to a coloured oil.	
	Hypocistis (<i>Cyti- sus hypocist.</i> Lin.)	Hypocistis.	The juice.	Astringent.	Juice inspissated.	
	Hyssopus (<i>H. offi- cinalis</i> , Lin.)	Hyssop.	The leaves.	Aromatic and pec- toral.	A distilled water.	
	Jalappa (<i>Convolvul- us jalappa</i> , Lin.)	Jalap.	The root.	Cathartic.	An extract, a simple tincture, a compound tincture, a re- fin, and powder.	
	Japonica terra. See <i>Catechu</i> , supra.					
	Imperatoria (<i>I. of- ficinum</i> , Lin.)	Master-wort.	The root.	Aromatic.		
	Indian root. See <i>Radix Indica</i> , in- fra.					
	Ipecacoanha (<i>Psy- chatria emetica</i> , Lin.)	Ipecacuanha.	The root (N.)	Emetic and cathar- tic.	A vinous tincture, and a pow- der.	

Iris

(N) A root has been sometimes imported, under the name of white ipecacuanha (*Viola ipecacuanha*, Lin.), which has little or nothing of the virtues of the true kind. More dangerous abuses, however, have been practised by the substitution or mixture of the roots of a kind of *apocynum*, which have been found to operate with great violence both upwards and downwards, so as to prove fatal in some cases. They may, however, easily be distinguished by their colour, which is a deep reddish yellow, while the true ipecacuanha is pale coloured or greyish: the poisonous roots are likewise larger, the fissures more distant, and the intermediate spaces smoother, than in the true ipecacuanha. This root is found to increase the purgative virtue of jalap remarkably. Dr Aikin informs us, that 15 grains of jalap, with two or three of ipecacuanha, purge more than twice the quantity of jalap by itself.

“Of late (says Dr Monro), a notion has prevailed, that the keeping up a nausea by means of small doses of ipecacuanha, or of watery solution of emetic tartar, was of great service in promoting the cure of fevers, as well as of fluxes, from a belief that they affected the nervous system, and were capable of exciting the action of the extreme vessels, and of increasing the secretions by the skin, and of the internal organs. Hitherto I have not found this method to answer my expectations; and I have always observed, that such a dose of an emetic as emptied the stomach freely, and gave a shake to the whole frame, had a much better effect than

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List of Simples.	TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	List of Simples.
	Iris Florentina, (Lin.)	Florentine oris.	The root.	Aromatic and sti- mulant.	An ingredient in several pec- toral medicines.	
	Iris palustris. See <i>Gladiolum</i> , supra.					
	Juglans (<i>J. regia</i> , Lin.)	The walnut-tree.	The fruit.	The kernel emol- lient, the shell astringent.		
	Jujuba, (<i>Rhamnus</i> <i>zizyph.</i> Lin.)	Jujubes.	The fruit.	Emollient and bal- samic.		
	Juncus odoratus. See <i>Calamus</i> , su- pra.					
	Juniperus (<i>J. com- munis</i> , Lin.)	Juniper.	The berries, wood, and resin.	Carminative and stomachic.	An essential oil, and spirituou water. Ingredient in sever- al officinal compositions.	
	Kermes (<i>Coccus</i> <i>querc. ilic.</i> Lin.)	Kermes.		Astringent and cor- roborant.	A confection.	
	Kino. See <i>Gum</i> <i>Kino</i> , supra.					
	Lac.	Milk.		Analeptic and cor- roborant.	A saccharine salt.	
	Lacca. See <i>Gum</i> <i>Lacca</i> , supra.					
	Lactuca, (<i>L. sati- va</i> , Lin.)	Garden lettuce.	The leaves and seeds.	Supposed narcotic		
	Lactuca virofa, (Lin.)	Wild lettuce.	Juice.	Laxative, diuretic, and diaphoretic.	An extract.	
	Ladanum (<i>Cistus</i> <i>creticus</i> , Lin.)	Ladanum.	The gum-resin.		Ingredient in the stomachic plaster.	
	Lamium album (Lin.)	White archangel, or dead-nettle.	The leaves and flowers.	Supposed corrobo- rant.		
	Lavendula (<i>L. Spi- ca</i> , Lin.)	Greater, or broad- leaved lavender.	The flowers.	An excellent cor- dial and aroma- tic.	An essential oil, a simple and compound spirit, and a conserve. An ingredient in some officinal preparations.	
	Laurus (<i>L. nobilis</i> , Lin.)	The bay-tree.	The leaves and ber- ries.	Carminative and antispasmodic.	An expressed oil. An ingre- dient in different composi- tions.	
	Lentiscus (<i>Pistacia</i> <i>lentiscus</i> , Lin.)	The lentise or ma- stich tree.	The wood.	Astringent, tonic, and diuretic.		
	Lepidium, (<i>L. lati- fol.</i> Lin.)	Common broad dit- tander, pepper- wort, or poor man's pepper.	The leaves.	Antiscorbutic and diuretic.		
	Levisticum (<i>Ligu- sticum levisticum</i> , Lin.)	Lovage.	The root and seed.	Aromatic.	Ingredients in some compound waters.	
	Lichen cinereus ter- restris (<i>L. cani- nus</i> , Lin.)	Ash-coloured ground liver- wort.	The whole.	Recommended by Dr Mead as a spe- cific against the bite of a mad dog, but without foun- dation.	Principal ingredient in the <i>pulvis antilyssus</i> .	
	Lichen islandicus (Lin.)	Eatable liverwort.	The herb.	Nourishing, antisept- ic, and laxative.		

4 P 2

Lignum

those frequently repeated small doses, which kept the patient in a disagreeable uneasy situation for hours to-
gether; and I am persuaded, that no practitioner of experience, who has attended large hospitals, where he
has had an opportunity of trying and seeing the effects of different medicines, will ever recommend this nau-
seating method for general practice in fevers, though it may be of use in some particular cases."

List of Simples.	TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	List of Simples.
	Lignum campe- chense (<i>Hæ- matoxylum cam- pech.</i> Lin.)	Logwood.	The wood.	Astringent.	An extract.	
	Lignum rhodium, (<i>Genista canari- ensis</i> , Lin.)	Rose-wood.	The wood.	Cordial.	An essential oil.	
	Ligusticum. See <i>Levesticum</i> , supra.					
	Lilium convallium, (<i>Conval. maïal.</i> Lin.)	Lilly of the valley.	The root and flow- ers.	Cephalic and ner- vine.		
	Lilium album, (<i>L. candidum</i> , Lin.)	White lily.	The root.	Emollient.	Poultice.	
	Limon, (<i>Citrus me- dica</i> , Lin.)	The lemon-tree.	The fruit.	Aromatic, antiscor- butic, and cordial.	An essential oil; an ingredi- ent in several compositions.	
	Linaria (<i>Antirrhini- num linaria</i> , Lin.)	Toad-flax.	The leaves.	Diuretic and ca- thartic, but doubtful.		
	Lingua cervina, (<i>Asplenium scolopend.</i> Lin.)	Hart's tongue.	The leaves.	Aperient.		
	Linum catharticum (<i>Euphorbia lathy- rus</i> , Lin.)	Purging flax.	The leaves.	Cathartic.	Infusion in whey. Dried powder.	
	Linum Sativum (<i>L. usitatissimum</i> , Lin.)	Flax.	The seed.	Emollient.	An expressed oil. Cataplasm.	
	Liquida ambra (<i>acerne- gundo</i> , Lin.)	Sweet gum, or storax tree.	The resinous juice.	Aromatic and cor- dial.		
	Lithospermum (<i>L. officinale</i> , Lin.)	Gromwell.	The seeds.	Resolvent; lithon- triptic.		
	Lobelia (<i>L. siphiliti- ca</i> , Lin.)	Blue cardinal flower.	The root (o).	Alterant, and deter- gent.	Decoction.	
	Lujula, or wood- forrel. See <i>Ace- tosella</i> , supra.					
	Lumbrici et limaces terrestres.	Earth worms and snails.		Aperient and ana- leptic.	Decoction in milk.	
	Lupinus (<i>L. albus</i> , Lin.)	White lupines.	The seeds.	Anthelmintic.		
	Lupulus (<i>Humul.</i> <i>lup.</i> Lin.)	Hops.	The loose leafy heads which grow upon the tops of the stalks.	Diuretic and stoma- chic.		

Lycoperdon

(o) This root was long a famous secret among the North American Indians for curing the venereal disease. The secret was purchased by Sir William Johnson, and has been published in the writings of Bartram, Kalm, &c. The following method of using it is, by Dr Aikin, recommended as the best: "A decoction is made of an handful of the roots in three measures of water. Of this half a measure is taken in the morning fasting, and repeated in the evening; and the dose is gradually increased till its purgative effect becomes too violent, when the medicine is for a time to be intermitted, and then renewed till a perfect cure is effected. One dose daily is sufficient during the latter part of the treatment; and the regimen, during the whole process, is to be equally strict with that observed in a course of mercurial salivation. From the third day, the ulcers are to be well washed twice daily with the decoction; and it is said, that when they are very deep and foul, the Indians sprinkle them with powder of the internal bark of the spruce tree. By this method we are assured that inveterate venereal complaints are cured without the aid of mercury."

List of Simples.	TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	List of Simples.
	Lycoperdon (<i>L. bovista</i> , Lin.)	Puff ball, or dusty mushroom.	The whole.	Styptic.		
	Macis. See <i>Nux Moschata</i> , infra.					
	Majorana (<i>Origanum majorana</i> , Lin.)	Sweet marjoram.	The leaves and flowers.	Aromatic and errhine.	An essential oil.	
	Malabathrum (<i>Laurus cassia</i> , Lin.)	Indian leaf.		Aromatic.	An ingredient in mithridate and theriaca.	
	Malva (<i>M. sylvestris</i> , Lin.)	The mallow.	The leaves and flowers.	Emollient.	Ingredient in the decoction for glysters, used also in cataplasms and fomentations: formerly there was a conserve of the flowers.	
	Malus (<i>Pyrus malus</i> , Lin.)	The apple-tree.	The fruit.	Refrigerant and laxative.		
	Mandragora (<i>Atropa Mandrag.</i> Lin.)	The mandrake.	The leaves.	Narcotic.		
	Manna (<i>Fraxinus ornus</i> , Lin.)	The manna ash.	The concreted juice.	Laxative.	Gives name to an officinal lo-hoch, and enters several other compositions.	
	Marrubium (<i>M. vulgare</i> , Lin.)	White horehound.	The leaves.	Stomachic and aperient.	An ingredient in theriaca (p).	
	Marum Syriacum, (<i>Teucrium mar.</i> Lin.)	Syrian herb marsh.	The leaves.	Aromatic and errhine.	An ingredient in some cephalic snuffs.	
	Mastiche. See <i>Gum mastic</i> , supra.					
	Matricaria (<i>M. parthenium</i> , Lin.)	Feverfew.	The leaves and flowers.	Aperient and antispasmodic.		
	Mechoacanna, (<i>Convolvulus mechoac.</i> Lin.)	White jalap, or Mechoacan.	The root.	Cathartic.		
	Mel.	Honey.		Aperient and detergent.		
	Melampodium. See <i>Helleborus niger</i> , supra.					
	Melilotus (<i>Trifolium melilot.</i> Lin.)	Melilot.	The leaves and flowers.	Emollient and carminative.	Gives name to a plaster.	
	Melissa (<i>M. officin.</i> Lin.)	Balm.	The leaves.	Aromatic.	An essential oil, and an infusion.	
	Melo (<i>Cucumis melo</i> , Lin.)	The melon.	The seeds.	Refrigerant and emollient.		
	Mentha crispa (<i>Lin.</i>)	Danish or German curled mint.	The herb.	Aromatic and cordial.	A distilled water, essential oil, and essence. An ingredient in several officinal preparations.	
	Mentha vulgaris, (<i>M. viridis</i> , Lin.)	Spearmint.	The herb.	Aromatic and cordial.	A distilled water, an essential oil, a spirit, and essence. An ingredient in several officinal preparations.	
					Mentha	

(p) The juices of horehound and plantain mixed are remedies of great repute in America against the bite of the rattlesnake. They are given by spoonfuls at short intervals; while at the same time the wounded part is covered with a cataplasm of the same herbs bruised. The good effects are said to be speedy, and the recovery of the patient complete and certain.

TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
<i>Mentha piperitis</i> (<i>M. piperita</i> , Lin.)	Pepper-mint.	The herb.	Aromatic and cor- dial.	A distilled water, essential oil, and essence. An ingredient in several officinal prepara- tions.
<i>Mercurialis</i> (<i>M.</i> <i>annua</i> , Lin.)	French mercury.	The leaves.	Emollient and laxa- tive.	A syrup.
<i>Meum</i> (<i>Æthusa</i> <i>meum</i> , Lin.)	Spignel.	The root.	Aromatic and car- minative.	
<i>Mezereon</i> (<i>Daphne</i> <i>mezereum</i> , Lin.)	Mezereon, or spurge olive.	The bark of the root.	Violently cathartic.	Decoction and powder.
<i>Millefolium</i> (<i>A-</i> <i>chillea millefol.</i> Lin.)	Millefoil, or yar- row.	The leaves and flowers.	Mildly astringent and aromatic.	An essential oil.
<i>Millepedæ</i> (<i>Oniscus</i> <i>asellus</i> , Lin.)	Wood-lice, hog- lice, or flaters.		Diuretic.	The insects dried and powder- ed; an infusion in wine; al- so an ingredient in some other officinal preparations.
Minium. See <i>Plumbum</i> , infra.				
<i>Morbus diaboli</i> <i>Scabiosa succisa</i> , Lin.)	Devil's bit.	The leaves and roots.	Diaphoretic.	
<i>Morus nigra</i> (Lin.)	The mulberry-tree.	The fruit and bark of the roots.	Refrigerant, astrin- gent, and anthel- mintic.	A syrup from the juice of the fruit.
<i>Moschus</i> (<i>M. mos-</i> <i>chiferus</i> , Lin.)	Musk.		Diaphoretic and antispasmodic.	A julep.
Myristica. See <i>Nux moschata</i> , infra.				
<i>Myrobalani</i> (<i>Pru-</i> <i>nus myrobalanus</i> , Lin.)	Myrobalans.	The fruit.	Purgative.	
Myrrha. See <i>Gum</i> <i>myrrha</i> , supra.				
<i>Myrrhia</i> (<i>Sison</i> <i>Canadense</i> , Lin.)	Sweet cicely.	The leaves and seeds.	Diuretic.	
<i>Myrtillus</i> (<i>Vaccini-</i> <i>um myrtil.</i> Lin.)	Whortle-berry.	The leaves and berries.	Astringent.	
<i>Myrtus</i> (<i>M. commu-</i> <i>nis</i> , Lin.)	The myrtle.	The berries.	Astringent.	
<i>Napus</i> (<i>Brassica na-</i> <i>pus</i> , Lin.)	Sweet navew, or navew gentle.	The seeds.	Aromatic.	An ingredient in the theriac.
<i>Nardus Indica</i> , (<i>Andropogon nar-</i> <i>dus</i> , Lin.)	Indian nard.	The roots.	Stomachic and car- minative.	Ingredient in the mithridate and theriaca.
<i>Nasturtium aquati-</i> <i>cum</i> (<i>Sisymbrium</i> <i>nasturtium</i> , Lin.)	Water cresses.	The leaves and juice.	Aperient and anti- scorbutic.	An ingredient in the succi scorbutici.
<i>Nasturtium hor-</i> <i>tense</i> (<i>Lepidium</i> <i>sativum</i> , Lin.)	Garden cresses.	The leaves and seeds.	Aperient and anti- scorbutic, but much weaker than the former.	
<i>Nepeta</i> (<i>N. cataria</i> , Lin.)	Nep, or catmint.	The leaves.	Aromatic and cor- dial.	
<i>Nephriticum lig-</i> <i>num</i> (<i>Guilandina</i> <i>moringa</i> , Lin.)	Nephritic wood.	The wood in sub- stance.	Diuretic, but un- certain.	
<i>Nicotiana</i> (<i>Nicotia-</i> <i>na tabacum</i> , Lin.)	Tobacco.	The leaves.	Violently emetic, cathartic, and narcotic.	An extract recommended by Stahl and other German physicians.

List of Simples.	TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	List of Simples.
	<i>Nigella</i> (<i>Nigella</i> <i>fativa</i> , Lin.)	Fennel-flower.	The seeds.	Aperient and diu- retic, but uncer- tain.		
	Nitrum.	Nitre or salt-petre.		Diaphoretic, diure- tic, and refrige- rant.	An acid spirit and fixed alka- line salt, an aqueous decoc- tion or solution, troches. An ingredient in many o- ther officinal preparations.	
	<i>Nummularia</i> (<i>Ly-</i> <i>simachia nummu-</i> <i>laria</i> , Lin.)	Moneywort, or herb twopence.	The leaves.	Antiscorbutic.		
	<i>Nux moschata</i> (<i>Myristica aro-</i> <i>matica</i> , Lin. <i>My-</i> <i>ristica moschata</i> , Aët. Holm.)	The nutmeg-tree.	The fruit, and co- vering called <i>mace</i> .	An excellent aro- matic, cordial, and stomachic.	An expressed oil, falsely call- ed <i>oil of mace</i> ; an essential oil; a simple water; a spi- rituous water; an ingredient in many officinal compo- sitions.	
	<i>Nux pistachia</i> (<i>Pi-</i> <i>stachia vera</i> , Lin.)	The pistachia-tree.	The fruit.	Emollient and ana- leptic.		
	<i>Nux vomica</i> (<i>Strychnos nux-</i> <i>vom.</i> Lin.)	<i>Nux vomica</i> .	The fruit.	Narcotic.		
	<i>Nymphaea alba</i> (Lin.)	White water-lily.	The roots and flowers.	Astringent and corroborative.		
	Ochra	Yellow ochre.		Astringent, but very weak.		
	<i>Oenanthe</i> (<i>Oe. cro-</i> <i>cata</i> , Lin.)	Hemlock drop- wort.	Leaves and root.	A virulent poison:	But the juice of the root, or the infusion of the leaf, has been recommended in chronic eruptions. The latter has been also found useful as an emmenagogue.	
	Olibanum. See <i>Gum</i> <i>olibanum</i> , supra.					
	<i>Oliva</i> (<i>Olea Euro-</i> <i>pea</i> , Lin.)	The olive-tree.	The fruit.	Emollient.	An expressed oil used in almost all ointments, plasters, &c.	
	<i>Ononis</i> (<i>O. spinosa</i> , Lin.)	Rest-harrow, cam- mock, or petty- whin.	The root.	Aperient and diu- retic.		
	<i>Opium</i> (<i>Papaver</i> <i>Orientalis</i> , Lin.)	The Asiatic poppy.	The inspissated juice.	A most excellent anodyne and cor- dial when pro- perly applied, but a very fatal poison if taken in too great quan- tity.	Purified by straining, called the <i>Thebaic extract</i> ; a vi- nous and spirituous tincture, called <i>liquid laudanum</i> . Also a capital ingredient in many officinal preparations.	
	Opopanax. See <i>Gum</i> <i>opopanax</i> , supra.					
	<i>Origanum</i> (<i>O. vulg.</i> Lin.)	Wild marjoram.	The leaves.	Aromatic.	An essential oil.	
	<i>Oryza</i> (<i>O. sativa</i> , Lin.)	Rice.	The grain.	Emollient and re- frigerant.		
	<i>Oxylapathum</i> (<i>Rumex acutus</i> , Lin.)	Sharp-pointed dock.	The roots and leaves.	Alterant and laxa- tive.		
	<i>Paeonia</i> (<i>P. officina-</i> <i>lis</i> , Lin.)	Male and female peony.	The roots, flowers, and seeds.	Emollient and an- tispasmodic.	Ingredients in some anti-epi- leptic powders.	
	<i>Palma</i> (<i>Cocos buty-</i> <i>racea</i> , Lin.)	The palm-tree.	The kernels of the fruit.	Emollient and ano- dyne.	An expressed oil used in sto- machic plasters.	
	<i>Palma Christi</i> . See <i>Ricinus</i> , infra.					

TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Papaver album (<i>P. somniferum</i> , Lin.)	The white poppy.	The heads.	Anodyne.	A syrup.
Papaver erraticum (<i>P. rhæas</i> , Lin.)	Red poppy, or corn-rose.	The flowers.	Valued chiefly for the colour they communicate.	A syrup.
Paralyfis (<i>Primula veris offic.</i> Lin.)	Cowslip.	The flowers.	Corroborant and antispasmodic.	A syrup.
Pareira brava (<i>Cissampelos pareira</i> , Lin.)	Pareira brava.	The root.	Attenuant, diuretic, and lithontriptic.	
Parietaria (<i>P. officinalis</i> , Lin.)	Pellitory of the wall.	The leaves.	Emollient and diuretic.	Ingredient in a nephritic decoction.
Pastinaca (<i>P. sativa</i> , Lin.)	Garden parsnip.	The roots and seeds.	Emollient and aromatic.	
Pastinaca silvestris (Lin.)	Wild parsnip.	The seeds.	Aromatic.	
Pentaphyllum (<i>Potentilla reptans</i> , Lin.)	Cinquefoil.	The root.	Astringent.	
Perficaria urens (<i>Polygonum hydropiper</i> , Lin.)	Bitter arsmart, lake-weed, or water-pepper.	The leaves.	Diuretic and detergent when externally applied.	
Perficaria mitis (<i>Polygonum persic.</i> Lin.)	Spotted arsmart.	The leaves.	Antiseptic and astringent.	
Perfica (<i>Amygdalus persica</i> , Lin.)	The peach-tree.	The leaves, flowers, and fruit.	Laxative, anthelmintic, and refrigerant.	
Peruvianus cortex (<i>Cinchona officinalis</i> , Lin.)	The quinquina, or Jesuit's-bark-tree.	The bark.	A most excellent corroborative.	An extract, a resin, a spirituous tincture, a compound tincture, a tincture in volatile spirit; also an ingredient in the stomachic tincture.
Petasites (<i>Tussilago petasites</i> , Lin.)	Butterbur.	The root.	Aromatic, aperient, and deobstruent.	
Petroleum.	Rock oil.		Anodyne and corroborative when applied externally.	
Petroleum Barbadense (<i>Bitumen petroleum</i> , Lin.)	Barbadoes tar.		Discutient, sudorific, and corroborative.	
Petroselinum (<i>Apium petroselinum</i> , Lin.)	Common parsnip.	The roots, leaves, and seeds.	Aperient and somewhat aromatic.	The seeds an ingredient in an electuary.
Peucedanum (<i>P. officinale</i> , Lin.)	Hog's-fennel, or sulphur-wort.	The root.	Aperient, stimulating, and erethic.	
Pimenta (<i>Myrtus pimenta</i> , Lin.)	Pimento, Jamaica pepper, or allspice.	The berry.	Aromatic and stimulant.	The basis of a distilled water, a spirit, and an essential oil.
Pimpinella sanguiforba (<i>Sanguiforba officinalis</i> , Lin.)	The greater wild burnet.	The leaves.	Astringent.	
Pimpinella saxifraga (Lin.)	Burnet saxifrage.	The root, leaves, and seeds.	Diaphoretic, diuretic, and antiseorbutic.	
Pinus sylvestris (Lin.)	The pine-tree.	The kernels of its fruit or cones, and resin.	The kernels emollient; for the resin, see <i>Terebinthina</i> , infra.	

TECHNICAL NAMES, ENGLISH NAMES,	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Piper longum (<i>Lin.</i>) Long pepper. } Piper nigrum (<i>Lin.</i>) Black pepper. } Piper Jamaicaense. See <i>Pimenta</i> , su- pra.		Highly aromatic and stimulant.	
Piper Indicum (<i>Capsicum an- nuum</i> , <i>Lin.</i>)	Guinea pepper.		A powder called <i>Cayenne pep- per</i> .
Pix liquida (<i>Pi- nus sylvestris</i> , <i>Lin.</i>)	Tar.	Attenuant and sti- mulating.	An infusion in water, and an ingredient in a kind of pec- toral pills.
Pix Burgundica (<i>Pinus abies</i> , <i>Lin.</i>)	Burgundy pitch.	A warm adhesive resinous sub- stance.	Ingredient in several plasters, ointments, and cerates.
Plantago latifolia, <i>P. major</i> , <i>Lin.</i>)	Common broad- leaved plantane.	The leaves.	
Plumbum.	Lead.	Astringent.	
		Astringent and re- frigerating, but very dangerous.	Several chemical preparations. See <i>CHEMISTRY-Index</i> . A tincture and extract, or so- lution in vegetable acids; also an ingredient in several ointments, &c.
Polium montanum (<i>Teucrium poli- um</i> , <i>Lin.</i>)	Poley-mountain.	The tops.	Aromatic. Ingredient in the Mithridate and theriaca.
Polygala amara (<i>Lin.</i>)	Milkwort.	The root.	Purgative.
Polygala fenega (<i>Lin.</i>)	Rattlesnake root.	The roots.	Stimulating, atte- nuant, and diu- retic.
Polypodium (<i>P. vulgare</i> , <i>Lin.</i>)	Polypody.	The root.	Laxative.
Populus nigra, (<i>Lin.</i>)	Black poplar.	The buds.	Aromatic. Used only in an ointment, but capable of being applied to better purposes.
Porrum (<i>Allium porrum</i> , <i>Lin.</i>)	The leek.	The root.	A stimulating diu- retic.
Portulaca (<i>P. ole- racea</i> , <i>Lin.</i>)	Purslane.	The seeds.	Refrigerant.
Primula veris (<i>Lin.</i>)	Primrose.	The herb and root.	Aromatic and sto- machic.
Prunella (<i>P. vulga- ris</i> , <i>Lin.</i>)	Self-heal.	The leaves.	Attenuant and de- tergent.
Pruna Gallica (<i>Pru- nus domestica</i> , <i>Lin.</i>)	French or common prunes.	The fruit.	Cooling and ape- rient.
Prunus Sylvestris. See <i>Acacia Ger- manica</i> , supra.			
Psyllium (<i>Planta- go psyll.</i> <i>Lin.</i>)	Fleawort.	The seeds.	Emollient and laxa- tive.
Ptarmica (<i>Achillea ptarmica</i> , <i>Lin.</i>)	Sneezewort, or ba- stard pellitory.	The root.	Errhine and stimu- lating.
Pulegium (<i>Mentha puleg.</i> <i>Lin.</i>)	Pennyroyal.	The flower.	A warm aromatic.
			A simple water, a spirituous water, an essential oil; and an ingredient in some other official compositions.
Pulmonaria maculo- sa (<i>P. officinalis</i> , <i>Lin.</i>)	Spotted lung-wort, or sage of Jeru- salem.	The leaves.	Said to be aperient and analeptic.
Pulsatilla nigricans (<i>Anemone pra- tensis</i> , <i>Lin.</i>)	Meadow anemone.	The herb and flower.	Emetic, diuretic, and cathartic.
			An extract and distilled water, used in venereal complaints, and certain disorders of the eye.

TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Pyrethrum (<i>Anthemis pyrethra</i> , Lin.)	Pellitory of Spain.	The root.	Promotes the salival flux.	
Quassia (<i>Q. Simarouba</i> , Lin.)	Simarouba.	The bark.	Antiseptic; useful in dysentery.	See <i>Ed. Phil. Transf.</i> vol. ii.
Quassia (<i>Q. amara</i> , Lin.)	Quassy.	The wood.	Stomachic and tonic.	An extract.
Quercus (<i>Q. robur</i> , Lin.)	Oak-tree.	The bark.	Strongly astringent.	
Quercus marina (<i>Fucus vesiculosus</i> , Lin.)	Sea-wrack or oak.	The herb.	Astringent and detergent.	A powder of the burnt herb.
Radix Indica Lopeziana (<i>Gaub. Advers.</i>)	Indian or Lopez root.		Astringent.	
Raphanus rusticus (<i>Cochlearia armoracea</i> , Lin.)	Horse-radish.	The root.	Stimulating and attenuant.	A compound water.
Rhabarbarum (<i>Rheum palmatum</i> , Lin.)	Rhubarb.	The root.	Cathartic and stomachic.	Toasted; a watery infusion; vinous and spirituous tinctures; and an ingredient in several officinal compositions.
Rhamnus catharticus. See <i>Spina cervina</i> , infra.)				
Rhaponticum (<i>Rheum rhabon</i> , Lin.)	Rhapontic.	The roots.	Laxative.	
Rhododendron chrysanthemum (Lin.)	Rhododendron.	The herb.	Powerfully sedative.	Decoction and powder; lately found serviceable in the gout and rheumatism.
Ribes nigrum (Lin.)	The black-currant bush.	The fruit.	Refrigerant and detergent.	} A jelly.
Ribes rubrum (Lin.)	The red-currant bush.	The fruit.	Ditto.	
Ricinus, (<i>R. communis</i> , Lin.)	Palma Christi.	The seed.	Laxative, anthelmintic.	Expressed oil.
Rosa damascena (<i>R. centifolia</i> , Lin.)	Damask rose.	The flower.	Aromatic and gently laxative.	A distilled water and syrup.
Rosa rubra (<i>R. Gallica</i> , Lin.)	The red rose.	The flower.	Astringent and corroborative.	A conserve, honey, tincture, troches, vinegar, and syrup. An ingredient in several officinal compositions.
Rosmarinus hortensis (<i>R. officinalis</i> , Lin.)	Rosemary.	The tops and flowers.	A fine aromatic and cordial.	An essential oil; a distilled spirit called <i>Hungary water</i> . An ingredient in many cordial and antispasmodic medicines.
Rubia tinctorum, (Lin.)	Madder.	The root.	Aperient and detergent.	
Rubus idæus, (Lin.)	The rasp-berry bush.	The fruit.	Refrigerant.	A syrup.
Rubus niger (<i>R. fruticosus</i> , Lin.)	The bramble.	The leaves.	Astringent.	
Ruscus (<i>R. aculeatus</i> , Lin.)	Butcher's-broom, or knee-holly.	The root.	Aperient.	Ingredient in diet-drinks.
Ruta (<i>R. graveolens</i> , Lin.)	Broad-leaved rue.	The leaves and seeds.	Powerfully stimulating, attenuating, and detergent.	An extract; and an ingredient in several compositions.

List of Simples.	TECHNICAL NAMES, ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	List of Simples.
	Sabadilla. See <i>Cevadilla</i> , supra.				
	Sabina (<i>Juniperus sabina</i> , Lin.)	Savin. The leaves or tops.	A stimulating aperient.	An essential oil; a watery extract; and an ingredient in several officinal compositions.	
	Saccharum (<i>Arun- do saccharifera</i> , Lin.) purificatum & non purificatum.	Sugar, refined and brown.			
	Saccharum cantum, album & rubrum.	Sugar-candy, white and brown.			
	Sagapenum (<i>Ferula orientalis</i> , Lin.)	Gum sagapenum.	Emollient and laxative.		
	Sal alkali vegetabile.	Vegetable alkaline salt, or pearl-salt.	Aperient and deobstruent.	An ingredient in several antispasmodic medicines.	
	Sal alkali minerale.	Mineral alkali, salt of Soda, or basis of sea-salt.	Aperient, diuretic, and caustic.	The basis of a great number of neutral salts.	
	Sal ammoniac. See <i>Ammoniac</i> .		Ditto.	Ditto.	
	Sal catharticus amarus.	Epsom salt.	Cathartic.	Magnesia.	
	Sal commune.	Common salt.	In small doses stimulant, in large ones cathartic.		
	Salicaria (<i>Lythrum Salicar</i> , Lin.)	Purple loose-strife. The herb.	Astringent.		
	Salix (<i>S. fragilis</i> , Lin.)	The crack-willow. The bark.	Corroborant.		
	Salvia (<i>S. officinalis</i> , Lin.)	Common sage. The leaves.	Moderately stimulating and astringent.	Infusions.	
	Sambucus (<i>S. nigra</i> , Lin.)	Common black-berried alder. The leaves, bark, flowers and berries.	Cathartic, aromatic, and aperient.	A rob for internal use from the berries, and an ointment and oil from the flowers and bark; the flowers are also ingredients in some compound waters.	
	Sanguis draconis, (<i>Calamus rotang</i> , <i>Dracena draco</i> , <i>Pterocarpus draco</i> , &c. Lin.)	Dragon's-blood.	Astringent.	An ingredient in some officinal compositions.	
	Sanicula (<i>S. Europaea</i> , Lin.)	Sanicle. The leaves.	Supposed to be corroborant.		
	Santalum citrinum, (<i>S. album</i> , Lin.)	Yellow sanders. The wood.	Greatly recommended by Hoffman as a restorative.	Essential oil; extract.	
	Santalum rubrum (<i>Pterocarpus santalinus</i> , Lin.)	Red sanders. The wood.	Used only for its colour.		
	Santonium (<i>Artemisia santonica</i> , Lin.)	Worm-seed.	Anthelmintic.		

List of Simple.	TECHNICAL NAMES. ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.	List of Simple.
	Sapo durus. Hard Spanish soap.	}	Resolvent and stimulating.	The first gives name to a plaster, liniment, balsam, and pills; the second is an ingredient in the milder caustic; and the third in an anodyne plaster.	
	Sapo mollis. Common soft soap.				
	Sapo niger. Black soap.				
	Saponaria (<i>S. officinalis</i> , Lin.) Soapwort or bruise-wort.	The herb and root.	Aperient, corroborant, and sudorific.	Tincture; extract.	
	Sarcocolla (<i>Penaea sarcoc.</i> Lin.) Gum sarcocol.		Supposed a vulnerary.	Ingredient in the pulvis e cerussa.	
	Sarsaparilla (<i>Smilax sarsap.</i> Lin.) Sarsaparilla.	The root.	Alterant, and diaphoretic.	Infusions and extract.	
	Sassafras (<i>Laurus sassafras</i> , Lin.) Sassafras.	The root.	Alterant, aperient, and corroborant.	An essential oil; an ingredient in some official preparations.	
	Satureia (<i>S. hortensis</i> , Lin.) Summer savory.	The leaves.	A very pungent warm aromatic.		
	Satyrion mas (<i>Orchis mascula</i> , Lin.) Orchis.	The root.	Coagulant and corroborative.	Salep supposed to be a preparation from a root of this kind.	
	Saxifraga alba (<i>S. granulata</i> , Lin.) White-flowered saxifrage.	The roots and leaves.	} Supposed to be aperient, diuretic, and lithontriptic, but without just foundation.		
	Saxifraga vulgaris, (<i>Peucedanum fistulaus</i> , Lin.) Meadow saxifrage.	The leaves and seeds.			
	Scabiosa (<i>S. arvensis</i> , Lin.) Scabious.	The leaves.	Aperient, sudorific, and expectorant.		
	Scammonium (<i>Convolvulus scam.</i> Lin.) Scammony.	Roots.	Strongly cathartic.	Gives name to a powder, and is an ingredient in some official preparations.	
	Scilla (<i>S. maritima</i> , Lin.) The squill, or sea-onion.	The root.	Powerfully diuretic, stimulant, and expectorant.	A syrup, vinegar, oxymel, pills; the root dried, baked, and made into troches.	
	Scolopendrium. See <i>Lingua cervina</i> , supra.				
	Scordium (<i>Teucrium scordium</i> , Lin.) Water germander.	The leaves.	Deobstruent, diuretic, and sudorific, but doubtful.	An ingredient in mithridate, theriaca, and several other preparations.	
	Scorzonera (<i>S. bifpanica</i> , Lin.) Viper's grass.	The root.	Cordial and stimulant, but doubtful.		
	Scrophularia (<i>S. nodosa</i> , Lin.) Fig-wort.	The leaves and root.	Supposed corroborant, but doubtful.		
	Sebesten (<i>Cordia myxa</i> , Lin.) Sebesten plum.		Emollient.		
	Sedum acre (Lin.) Wall stone crop, or wall pepper.	The fresh plant.	Strongly purgative, emetic, and diuretic.		
	Sedum majus (<i>S. album</i> , Lin.) Greater houseleek.	The leaves.	Refrigerant.		
	Seneka. See <i>Polygala seneka</i> , supra.				
	Senna (<i>Cassia senna</i> , Lin.) Senna.	The leaves.	Cathartic.	Infusion, spirituous tinctures, compound powders, and an electuary.	

Serpentaria

TECHNICAL NAMES.	ENGLISH NAMES.	PARTS USED IN MEDICINE.	VIRTUES.	PREPARATIONS FROM THEM.
Serpentaria Vir- giniana (<i>Aristol- chia serpentar.</i> Lin.)	Virginian snake- weed.	The root.	A warm diaphore- tic and diuretic.	A spirituous tincture; and an ingredient in a number of tinctures.
Serpyllum (<i>Thy- mus serpil.</i> Lin.)	Mother of thyme.	The herb.	Aromatic.	
Seselis vulgaris, (<i>Tordylium offi- cin.</i> Lin.)	Common hartwort.	The seeds.	} Agreeable aroma- tics, but neglec- ted. <i>Lewis.</i>	
Seselis maffiliensis (<i>Seseli elatum,</i> Lin.)	Hartwort of Mar- seilles.	The seeds.		
Sigillum Salomo- nis (<i>Convallaria polygon.</i> Lin.)	Solomon's seal.	The root.	Probably emollient.	
Simarouba. See <i>Quassia simarouba,</i> supra.				
Sinapi (<i>Sinapis al- ba & nigra,</i> Lin.)	Mustard.	The seeds, black and white.	Strongly pungent and stimulant.	An expressed oil.
Sium (<i>S. nodiflo- rum,</i> Lin.)	Creeping skerrit, or water par- nip.	The herb.	The juice service- able in some cu- taneous disor- ders.	
Solanum (<i>S. nigr.</i> Lin.)	Nightshade.	The leaves.	Powerfully evacu- ant.	
Spermaceti (<i>Phy- feter macroceph- lus,</i> Lin.)	Spermaceti.		A mild emollient.	Gives name to a lochoch.
Spigelia (<i>S. Mari- landica,</i> Lin.)	Indian pink.	The root.	Anthelmintic.	
Spina cervina, (<i>Rhamnus cathar- ticus,</i> Lin.)	Buckthorn.	The berries.	Strongly cathartic.	A syrup.
Spiritus vinosi.	Vinous spirits.		Cordial and stimu- lant.	Used as menstruums for tinc- tures, &c. in almost every preparation of that kind.
Spongia (<i>S. offici- nal.</i> Lin.)	Sponge.		Used as a tent for dilating ulcers, &c.	Burnt, recommended in scro- phulous affections.
Stannum.	Tin.		Anthelmintic.	Powdered.
Staphisagria (<i>Del- phinium staphisa- gria,</i> Lin.)	Stavesacre.	The seeds.	A violent cathartic taken internally. Its external ap- plication de- stroys lice and other insects.	
Stoechas (<i>Laven- dula stoechas,</i> Lin.)	Arabian stoechas, or French laven- der.	The flowers.	Aromatic.	An ingredient in mithridate and theriaca.
Stramonium (<i>Da- tura stramon.</i> Lin.)	Thorn-apple.	The herb.	Narcotic.	An extract.
Styrax calamita (<i>S.</i> <i>officinalis,</i> Lin.)	Storax.		Aromatic, stimu- lant, and ner- vine.	Ingredient in some tinctures and pills.
Styrax liquida (<i>Li- quidamber styraci- flua,</i> Lin.)	Liquid storax.			Ingredient in a mercurial plaster.
Suber (<i>Quercus</i> <i>sub.</i> Lin.)	The cork-tree.	The bark.	Astringent.	

List of
Simples.

TECHNICAL NAMES, ENGLISH NAMES.

PARTS USED IN
MEDICINE.

VIRTUES.

PREPARATIONS FROM THEM.

List of
Simples.

Succinum.	Amber.		Astringent and cor- roborant.	A tincture, balsam, essential oil, and an ingredient in se- veral officinal preparations.
Sulphur.	Sulphur, and flow- ers of sulphur.		Laxative, diapho- retic, and alte- rant.	Solutions in different kinds of oils called <i>balsams</i> , and an ingredient in some oint- ments.
Sumach (<i>Rhus co- riaria</i> , Lin.)	Common sumach.	The leaves and feeds.	Astringent.	
Tacamahac (<i>Popu- lus balsamifera</i> , Lin.)	Tacamahac-tree.	The resin.	Discutient, emolli- ent, and suppu- rative.	An ingredient in several pla- sters.
Tamarindus (<i>T. Indica</i> , Lin.)	Tamarinds.	The fruit.	Refrigerant and laxative.	Ingredients in some laxative electuaries.
Tamariscus (<i>Ta- marix Gallica</i> , Lin.)	The tamarisk-tree.	The leaves and bark.	Astringent.	
Tanacetum (<i>T. vulgare</i> , Lin.)	Tanfy.	The leaves, flowers, and feeds.	Stimulating, anti- spasmodic, and anthelmintic.	
Taraxacum (<i>Leon- todon tarax.</i> Lin.)	Dandelion.	The leaves and root.	Attenuating and resolvent.	A distilled spirit, recom- mended by professor De- lius of England in asthma- tic and hydropic affec- tions.
Tartarum.	Tartar.		Refrigerant and ca- thartic.	Purified from its earthy parts, and called <i>cream of tartar</i> , the basis of some useful pur- ging salts. An alkali is al- so prepared from it by fire.
Terebinthina Ve- neta (<i>Pinus larix</i> , Lin.)	Venice turpentine.		} Warm stimula- ting diuretics and aperients.	
Terebinthina Ar- gentoratensis.	Straßburgh turpen- tine.			
Terebinthina Chia.	Chian, or Cyprus turpentine.			
Terebinthina com- munis.	Common turpen- tine.		Used chiefly in ex- ternal applica- tions.	An essential oil. The resi- duum forms the <i>resina alba</i> & <i>nigra</i> , or white and black rosin of the shops, used in almost every ointment.
Terra Japonica. See <i>Catechu</i> , supra.				
Thapsus barbatus (<i>Verpascum thap- sus</i> , Lin.)	Great white mul- lein.	The leaves and flowers.	Analeptic.	A spirituous extract from the flowers.
Thea bohea et vi- ridis (Lin.)	Bohea and green tea.	The leaves.	Cordial, diuretic, and diaphoretic.	An infusion.
Thlaspi (<i>T. ar- vense</i> , Lin.)	Treacle, or mithri- date mustard.	The seeds.	Aromatic and sti- mulant.	Ingredient in theriaca.
Thus vulgare.	Common frank- incense.		Supposed corrobo- rative.	Ingredient in some warm pla- sters.
Thymus citratus.	Lemon thyme.	The leaves.	An agreeable aro- matic.	A distilled water and essential oil.
Thymus vulgaris.	Common thyme.	The leaves.	An agreeable aro- matic.	A distilled water and essential oil.
Tilia (<i>T. Europæa</i> , Lin.)	The lime or linden tree.	The flowers.	Antispasmodic.	Infusion.
Tithymalus (<i>Eu- phorbia lathyris</i> , Lin.)	The spurge.	The juice of the root.	Violently cathartic.	

Tormentilla

General

General
Titles.*General TITLES including several SIMPLES.*

- The five opening roots: { Smallage,
Asparagus,
Fennel,
Parsley,
Butchers broom.
- The five-emollient herbs: { Marshmallows,
Mallows,
Mercury,
Pellitory of the wall,
Violets.
- The four cordial flowers: { Borage,
Bugloss,
Roses,
Violets.
- The four greater hot seeds: { Anise,
Caraway,
Cummin,
Fennel.
- The four lesser hot seeds: { Bishopseed,
Stone parsley,
Smallage,
Wild carrot.
- The four greater cold seeds: { Water melons,
Cucumbers,
Gourds,
Melons.
- The four lesser cold seeds: { Succory,
Endive,
Lettuce,
Purslane.
- The four capillary herbs: { Maidenhair,
English maidenhair,
Wall rue,
Ceterach.
- The four carminative flowers: { Camomile,
Feverfew,
Dill,
Melilot.

The simples of each of the above classes have been often employed together under the respective general appellations. This practice has entirely ceased amongst us; and accordingly these denominations are now expunged both from the London and Edinburgh pharmacopœias, and they are now retained in very few of the foreign ones. But as these articles are frequently mentioned under their general titles by writers of eminence, it was imagined that the above enumeration of them might be of some use.

GENERAL RULES for the Collection and Preservation of SIMPLES.

ROOTS.

Annual roots are to be taken up before they shoot
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out stalks or flowers: Biennial ones, chiefly in the autumn of the same year in which the seeds were sown: The perennial, when the leaves fall off, and therefore generally in the autumn. Being washed clean from dirt, and freed from the rotten and decayed fibres, they are to be hung up in a warm, shady, airy place, till sufficiently dried. The thicker roots require to be slit longitudinally, or cut transversely into thin slices. Such roots as lose their virtues by exsiccation, or are desired to be preserved in a fresh state, for the greater convenience of their use in certain forms, are to be kept buried in dry sand.

There are two seasons in which the biennial and perennial roots are reckoned the most vigorous, the autumn and spring; or rather the time when the stalks or leaves have fallen off, and that in which the vegetation is just to begin again, or soon after it has begun; which times are found to differ considerably in different plants.

The college of Edinburgh, in the two first editions of their pharmacopœia, directed them to be dug in the spring, after the leaves were formed; in the third edition the autumn was preferred. The generality of roots appear, indeed, to be most efficacious in the spring: but as at this time they are also the most juicy, and consequently shrivel much in drying, and are rather more difficultly preserved, it is commonly thought most advisable to take them up in autumn. No rule, however, can be given, that shall obtain universally: arum root is taken even in the middle of summer, without suspicion of its being less active than at other seasons; while angelica root is inert during the summer, in comparison of what it was in the autumn, spring, or winter.

HERBS and LEAVES.

Herbs are to be gathered when the leaves have come to their full growth, before the flowers unfold; but of some plants the flowery tops are preferred. They are to be dried in the same manner as roots.

For the gathering of leaves, there cannot perhaps be any universal rule any more than for roots; for though most herbs appear to be in their greatest vigour about the time of their flowering, or a little before, there are some in which the medicinal parts are more abundant at an earlier period.

Thus mallow and marshmallow leaves are most mucilaginous when young, and by the time of flowering approach more to a woody nature. A difference of the same kind is more remarkable in the leaves of certain trees and shrubs: the young buds, or rudiments of the leaves, of the black poplar tree, have a strong fragrant smell, approaching to that of storax; but by the time that the leaves have come to their full growth, their fragrance is exhausted.

Herbs are directed by most of the pharmaceutic writers to be dried in the shade; a rule which appears to be very just, though it has sometimes been misunderstood. They are not to be excluded from the sun's heat, but from the strong action of the solar light; by which last their colours are more liable to be altered or destroyed than those of roots. Slow drying of them in a cool place is far from being of any advantage: both their colours and virtues are preserved in greatest perfection

Collection
&c. of
Simples.

Collection,
&c. of
Simples.

perfection when they are dried hastily by the heat of common fire as great as that which the sun can impart: the juicy ones, in particular, require to be dried by heat, being otherwise subject to turn black. Odoriferous herbs, dried by fire till they become friable, discover indeed, in this arid state, very little smell; not that the odorous matter is dissipated, but on account of its not being communicated from the perfectly dry subject to dry air; for as soon as a watery vehicle is supplied, whether by infusing the plant in water, or by exposing it for a little time to a moist air, the odorous parts begin to be extracted by virtue of the aqueous moisture, and discover themselves in their full force.

Of the use of heat in the drying of plants, we have an instance in the treatment of tea among the Chinese. According to the accounts of travellers, the leaves, as soon as gathered, are brought into an apartment furnished with a number of little furnaces or stoves, each of which is covered with a clean smooth iron plate; the leaves are spread on the plates, and kept rolling with the hands till they begin to curl up about the edges; they are then immediately swept off on tables, on which one person continues to roll them, while another fans them that they may cool hastily: this process is repeated two or three times, or oftener, according as the leaves are disposed to unbend on standing.

EXSICCATION OF HERBS AND FLOWERS.

Herbs and flowers are to be dried by the gentle heat of a stove or common fire, and only in that quantity at a time by which the exsiccation may be very soon finished. By this means their strength is best preserved; and this is indicated in proportion as they retain their native colour.

But the leaves of hemlock, and some other herbs replete with a subtile volatile matter, are to be powdered immediately after the exsiccation, and preserved in glass vessels, well shut.

FLOWERS.

Flowers are to be gathered when moderately expanded, on a clear dry day, before noon. Red roses are taken before they open, and the white heels clipped off and thrown away.

The quick drying, above recommended for the leaves of plants, is more particularly proper for flowers; in most of which both the colour and smell are more perishable than in leaves, and more subject to be impaired by slow exsiccation. Of the flowers which come fresh into the apothecaries hands, the only ones employed dry in the London pharmacopœia are red roses; and these, in all the compositions in which they are used in a dry state, are expressly ordered to be dried hastily. One of the most valuable aromatics of European growth, saffron, is part of a flower, dried on paper on a kind of kiln, with a heat sufficient to make it sweat, taking care only not to endanger the scorching of it.

It may here be observed, that the virtues of flowers are confined to different parts of the flower in different plants. Saffron is a singular production growing at the end of the style or pistil. The active part of ca-

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momile flowers is the yellow disk, or button in the middle: that of lilies, roses, clove-july-flowers, violets, and many others, the petala or flower-leaves; while rosemary has little virtue in any of these parts, the fragrance admired in the flowers of this plant residing chiefly in the cups.

Collection,
&c. of
Simples.

SEEDS AND FRUITS.

Seeds should be collected when ripe, and beginning to grow dry, before they fall off spontaneously. Fruits are also to be gathered when ripe, unless otherwise ordered.

Of the fruits whose collection comes under the notice of the apothecary, there are few which are used in an unripe state; the principal is the sloe, whose virtue as a mild astringent is much diminished by maturation. The fruit of the orange tree, raised in our gardens or green-houses, is sometimes gathered in a state of much greater immaturity, soon after it is formed on the tree, before it has acquired its acid juice; at this time it proves an elegant aromatic bitter, nearly resembling what are called *Curassao oranges*, which appear to be no other than the same fruit gathered at the same period in a warmer climate.

The rule for collecting seeds is more general than any of the others, all the officinal seeds being in their greatest perfection at the time of their maturity. As seeds contain little watery moisture, they require no other warmth for drying them than that of the temperate air in autumn: such as abound with a gross expressible oil, as those commonly called the *cold seeds*, should never be exposed to any considerable heat; for this would hasten the rancidity, which, however carefully kept, they are very liable to contract. Seeds are best preserved in their natural husks or coverings, which should be separated only at the time of using; the husk, or cortical part, serving to defend the seed from being injured by the air.

WOODS AND BARKS.

The most proper season for the felling of woods, or shaving off their barks, is generally the winter.

No woods of our own growth are now retained by the London or Edinburgh colleges. The only two which had formerly a place in the catalogues of simples were the juniper and the box; the first of which is never kept in the shops, or employed in practice; the other may be procured from the turner; and it is indifferent at what season it has been cut down, being at all times sufficiently fit for the only use to which it was applied, the yielding an empyreumatic oil by distillation in a strong fire.

It may be doubted, whether barks are not generally more replete with medicinal matter in summer and spring than in winter. The barks of many trees are in summer so much loaded with resin and gum as to burst spontaneously, and discharge the redundant quantity. It is said that the bark of the oak answers best for the tanners at the time of the rising of the sap in spring: and as its use in tanning depends on the same astringent quality for which it is used in medicine, it should seem to be also fittest for medicinal purposes in the spring. It may be observed likewise, that it is in

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this

Collection,
&c. of
Simples.

this last season that barks in general are most conveniently peeled off.

ANIMAL SUBSTANCES.

Animal substances are to be chosen in their

most perfect state, unless they be ordered otherwise.

Whatever virtues these bodies may have, they are supposed to be best when they have attained to their common full growth.

Collection,
&c. of
Simples.

M A T

Material
||
Mathematic.

MATERIAL, denotes something composed of matter. In which sense the word stands opposed to immaterial. See MATTER and METAPHYSICS.

MATERIALISTS, a sect in the ancient church, composed of persons who, being prepossessed with that maxim in the ancient philosophy, *Ex nihilo nihil fit*, "Out of nothing nothing can arise," had recourse to an internal matter, on which they supposed God wrought in the creation; instead of admitting God alone as the sole cause of the existence of all things. Tertullian vigorously opposes the doctrine of the materialists in his treatise against Hermogenes, who was one of their number.

Materialists is also a name given to those who maintain that the soul of man is material; or that the principle of perception and thought is not a substance distinct from the body, but the result of corporeal organization: See METAPHYSICS. There are others, called by this name, who have maintained that there is nothing but matter in the universe; and that the Deity himself is material. See SPINOSISM.

MATHAM (Jaques), an engraver of considerable eminence, was born at Haerlem in 1571, and after the death of his father, Henry Goltzius, a celebrated painter and engraver, married his mother. From his father-in-law he learned the art of engraving. He went to Italy, to complete his studies from the works of the greatest masters; and in that country he engraved a considerable number of plates. At his return, he worked under the eye of Goltzius, and produced many very valuable prints. Following the example of his father-in-law, he worked entirely with the graver, in a clear, free style; and though he never equalled him in point of taste or correctness of drawing, especially when confined to the naked parts of the human figure, most of his prints are greatly esteemed.

MATHEMATICS, the science of quantity; or a science that considers magnitudes either as computable or measurable.

The word in its original, *μαθηματις*, signifies discipline, or science in the general; and seems to have been applied to the doctrine of quantity, either by way of eminence, or because, this having the start of all other sciences, the rest took their common name therefrom. See SCIENCE.

For the origin of the mathematics, Josephus dates it before the flood, and makes the sons of Seth observers of the course and order of the heavenly bodies: he adds, that, to perpetuate their discoveries, and secure them from the injuries either of a deluge or a conflagration, they had them engraven on two pillars, the one of stone, the other of brick; the former of which he says was standing in Syria in his days. See ASTRONOMY.

The first who cultivated mathematics after the flood

M A T

were the Assyrians and Chaldeans; from whom, the same Josephus adds, they were carried by Abraham to the Egyptians; who proved such notable proficient, that Aristotle makes no scruple to fix the first rise of mathematics among them. From Egypt, 584 years before Christ, they passed into Greece through the hands of Thales; who having learned geometry of the Egyptian priests, taught it in his own country. After Thales, comes Pythagoras; who, among other mathematical arts, paid a particular regard to arithmetic; fetching the greatest part of his philosophy from numbers: he was the first, as Laertius tells us, who abstracted geometry from matter; and to him we owe the doctrine of incommensurable magnitude, and the five regular bodies, besides the first principles of music and astronomy. Pythagoras was seconded by Anaxagoras, Ctenopides, Briso, Antipho, and Hippocrates of Scio; who all applied themselves particularly to the quadrature of the circle, the duplicature of the cube, &c. but the last with most success: this last is also mentioned by Proclus, as the first who compiled elements of mathematics.

Democritus excelled in mathematics as well as physics; though none of his works in either kind are extant, the destruction of which some authors lay at Aristotle's door. The next in order is Plato, who not only improved geometry, but introduced it into physics, and so laid the foundation of a solid philosophy. Out of his school proceeded a crowd of mathematicians. Proclus mentions 13 of note; among whom was Leodamus, who improved the analysis first invented by Plato; Theætetus, who wrote elements; and Archiatus, who has the credit of being the first who applied mathematics to use in life. These were succeeded by Neocles and Theon, the last of whom contributed to the elements. Eudoxus excelled in arithmetic and geometry, and was the first founder of a system of astronomy. Menechmus invented the conic sections, and Theudius and Hermotimus improved the elements.

For Aristotle, his works are so stored with mathematics, that Blancanus compiled a whole book of them: out of his school came Eudemus and Theophrastus; the first of whom wrote of numbers, geometry, and invisible lines; the latter, a mathematical history. To Aristeus, Hidorus, and Hypsicles, we owe the books of solids; which, with the other books of elements, were improved, collected, and methodised by Euclid, who died 284 years before Christ.

An hundred years after Euclid, came Eratosthenes and Archimedes. Cotemporary with the latter was Conon, a geometrician and astronomer. Soon after came Apollonius Pergæus; whose conics are still extant. To him are likewise ascribed the 14th and 15th books of Euclid, which are said to have been contracted

Mathematics.

Mathema-
tics

ted by Hypsicles. Hipparchus and Menelaus wrote on the subtenses in a circle, the latter also on spherical triangles: Theodosius's three books of spherics are still extant. And all these, Menelaus excepted, lived before Christ.

A. D. 70. Ptolemy of Alexandria was born; the prince of astronomers, and no mean geometrician: he was succeeded by the philosopher Plutarch, of whom we have still extant some mathematical problems. After him came Eutocius, who commented on Archimedes, and occasionally mentions the inventions of Philo, Diocles, Nicomedes, Sporus, and Heron, on the duplicature of the cube. To Ctesibius of Alexandria we owe our pumps; and Geminus, who came soon after, is preferred by Proclus to Euclid himself.

Diophantus of Alexandria was a great master of numbers, and the first inventor of algebra: among others of the ancients, Nicomachus is celebrated for his arithmetical, geometrical, and musical works; Serenus, for his books on the sections of the cylinder; Proclus, for his comments on Euclid; and Theon has the credit, among some, of being author of the books of elements ascribed to Euclid. The last to be named among the ancients, is Pappus of Alexandria, who flourished A. D. 400, and is celebrated for his books of mathematical collections still extant.

Mathematics are commonly distinguished into *pure and speculative*, which consider quantity abstractedly; and *mixed*, which treat of magnitude as subsisting in material bodies, and consequently are interwoven every where with physical considerations.

Mixed mathematics are very comprehensive; since to them may be referred astronomy, optics, geography, hydrostatics, mechanics, fortification, navigation, &c. See the articles ASTRONOMY, OPTICS, &c.

Pure mathematics have one peculiar advantage, that they occasion no disputes among wrangling disputants, as in other branches of knowledge; and the reason is, because the definitions of the terms are premised, and every body that reads a proposition has the same idea of every part of it. Hence it is easy to put an end to all mathematical controversies, by showing, either that our adversary has not stuck to his definitions, or has not laid down true premisses, or else that he has drawn false conclusions from true principles; and in case we are able to do neither of these, we must acknowledge the truth of what he has proved.

It is true, that in mixed mathematics, where we reason mathematically upon physical subjects, we cannot give such just definitions as the geometricians: we must therefore rest content with descriptions; and they will be of the same use as definitions, provided we are consistent with ourselves, and always mean the same thing by those terms we have once explained.

Dr Barrow gives a most elegant description of the excellence and usefulness of mathematical knowledge, in his inaugural oration, upon being appointed professor of mathematics at Cambridge.

The mathematics, he observes, effectually exercise, not vainly delude, nor vexatiously torment, studious minds with obscure subtilties; but plainly demonstrate every thing within their reach, draw certain conclusions, instruct by profitable rules, and unfold pleasant questions. These disciplines likewise enure and corro-

borate the mind to a constant diligence in study; they wholly deliver us from a credulous simplicity, most strongly fortify us against the vanity of scepticism, effectually restrain us from a rash presumption, most easily incline us to a due assent, and perfectly subject us to the government of right reason. While the mind is abstracted and elevated from sensible matter, distinctly views pure forms, conceives the beauty of ideas, and investigates the harmony of proportions; the manners themselves are sensibly corrected and improved, the affections composed and rectified, the fancy calmed and settled, and the understanding raised and excited to more divine contemplations.

MATHEMATICAL, any thing belonging to the science of mathematics.

MATHEMATICAL Instruments, such instruments as are usually employed by mathematicians, as compasses, scales, quadrants, &c.

Machine for dividing MATHEMATICAL Instruments. See RAMSDEN'S *Machine*.

MATHER (Dr Cotton), an eminent American divine, born at Boston in New England in the year 1663. He was educated in Harvard college, and in 1684 became minister of Boston; in the diligent discharge of which office he spent his life, and promoted several excellent societies for the public good: particularly one for suppressing disorders, one for reforming manners, and a society of peace-makers, whose professed business it was to compose differences and prevent law-suits. His reputation was not confined to his own country: for in 1710, the university of Glasgow sent him a diploma for the degree of doctor in divinity; and, in 1714, the Royal Society of London chose him one of their fellows. He died in 1728; and is said to have published in his life-time 382 pieces, including single sermons, essays, &c. yet several were of a larger size, among which was *Magnolia Christi Americana*, or an Ecclesiastical History of New-England, from its first planting in 1620 to 1698, folio. But the most remarkable of all his works was that in which, like Glanville, he defended the doctrine of witchcraft. We shall content ourselves with giving the title at large, which is as follows: "The wonders of the invisible world; being an account of the trials of several witches lately executed in New-England, and of several remarkable curiosities therein occurring. Together with, 1. Observations on the nature, the number, and the operations of the devils. 2. A short narrative of a late outrage committed by a knot of witches in Swedeland; very much resembling, and so far explaining that under which New-England has laboured. 3. Some counsels directing a due improvement of the terrible things lately done by the unusual and amazing range of evil spirits in New-England. 4. A brief discourse upon the temptations which are the more ordinary devices of Satan. By Cotton Mather; published by the special command of his excellency the governor of the province of Massachusetts Bay in New-England." Printed first at Boston in New-England, and reprinted at London, in 1736, 4to.

MATLOCK, a town or village of Derbyshire, near Wicksworth, situated on the very edge of the Derwent; noted for its bath, the water of which is milk-warm; and remarkable for the huge rocks in its en-

Mathema-
tical
Matlock

Matrafs
||
Matrice.

virons, particularly those called the *Torr*, on the east side of the Derwent, over against it, which seem to be piled one upon another. It is an extensive straggling village, built in a very romantic style, on the steep side of a mountain, rising irregularly from the bottom to nearly the summit. Near the bath are several small houses, whose situation is on the little natural horizontal parts of the mountain, a few yards above the road, and in some places the roofs of some almost touch the floors of others. There are excellent accommodations for company who resort to the bath; and the poorer inhabitants are supported by the sale of petrifications, crystals, &c. and notwithstanding the rockiness of the soil, the cliffs produce an immense number of trees, whose foliage adds greatly to the beauty of the place.

MATRASS, CUCURBIT, or BOLT-HEAD, among chemists. See CHEMISTRY, n° 579.

MATRICARIA, FEVERFEW, in botany: A genus of the polygamia superflua order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ*. The receptacle is naked; there is no pappus; the calyx hemispherical and imbricated, with the marginal leaflets solid, and something sharp. There are five species, but the only remarkable one is the parenthium or common feverfew. This hath very fibrous clustering roots, crowned with numerous compound leaves; upright stalks branching on every side two or three feet high; garnished with compound plain leaves of seven oval folioles, cut into many parts; and all the branches terminated by many compound radiated white flowers having a yellow disk. There are varieties with double flowers, with semi-double flowers, with double fistular flowers, with a fistular disc and plain radius, with short-rayed flowers, with rayless flowers, with rayless sulphur-coloured heads, and with finely curled leaves.—All these varieties flower abundantly in June, each flower being composed of numerous hermaphrodite and female florets; the former compose the disk, the latter the radius or border, and which, in the double and fistular kinds, are very ornamental in gardens, but of a disagreeable odour; and are all succeeded by plenty of seed in autumn, by which they are easily propagated, as well as by parting the roots and cuttings.

Medical uses. This plant has received a most extraordinary character in hysteric and other affections of the nerves, as well as for being a carminative or warm stimulating bitter. Dr Lewis, however, thinks it inferior to camomile; with which he says it agrees in all its sensible qualities, only being somewhat weaker.

MATRICE, or MATRIX. See MATRIX.

MATRICE, or matrix, in dyeing, is applied to the five simple colours, whence all the rest are derived or composed. These are, the black, white, blue, red, and yellow or root colour.

MATRICE, or matrices, used by the letter-founders, are those little pieces of copper or brass, at one end whereof are engraven, dent-wise, or *en creux*, the several characters used in the composing of books. Each character, virgula, and even each point in a discourse, has its several matrix; and of consequence, its several puncheon to strike it. They are the engravers on metal that cut or grave the matrices.

When types are to be cast, the matrice is fastened to the end of a mould, so disposed as that when the metal is poured on it, it may fall into the creux or cavity of the matrice, and take the figure and impression thereof. See *Letter-Foundry*.

MATRICES, used in coining, are pieces of steel in form of dyes, whereon are engraven the several figures, arms, characters, legends, &c. wherewith the species are to be stamped. The engraving is performed with several puncheons, which being formed in relievé, or prominent, when struck on the metal, make an indented impression, which the French call *en creux*.

MATRICULA, a register kept of the admission of officers and persons entered into any body or society whereof a list is made. Hence those who are admitted into our universities are said to be matriculated. Among ecclesiastical authors, we find mention made of two kinds of matricula; the one containing a list of the ecclesiastics called *matricula clericorum*; the other of the poor subsisted at the expence of the church, called *matricula pauperum*.

MATRICULA was also applied to a kind of almshouse, where the poor were provided for. It had certain revenues appropriated to it, and was usually built near the church; whence the name was also frequently given to the church itself.

MATRIMONY. See MARRIAGE.

MATRIX, in anatomy, the womb, or that part of the female of any kind, wherein the foetus is conceived and nourished till the time of its delivery. See ANATOMY, n° 108.

MATRIX is also applied to places proper for the generation of vegetables, minerals, and metals. Thus the earth is the matrix wherein seeds sprout; and marcasites are by many considered as the matrices of metals.

The matrix of ores is the earthy and stony substances in which these metallic matters are enveloped: these are very various, frequently spar, quartz, fluors, or horn-blend.

MATRON, an elderly married woman.

Jury of MATRONS. When a widow feigns herself with child in order to exclude the next heir, and a supposititious birth is suspected to be intended, then, upon the writ *de ventre inspiciendo*, a jury of women is to be impanelled to try the question whether the woman is with child or not. So, if a woman is convicted of a capital offence, and, being condemned to suffer death, pleads in stay of execution, that she is pregnant, a jury of matrons is impanelled to inquire into the truth of the allegation; and, if they find it true, the convict is respited till after her delivery.

MATRONA, (anc. geog.), a river separating Gallia Celtica from the Belgica (Cesar.) Now the Marne; which, rising in Champaign near Langres, runs north-west, and then west, and passing by Meaux falls into the Siene at Charenton, two leagues to the east of Paris.

MATRONALIA, a Roman festival instituted by Romulus, and celebrated on the kalends of March, in honour of Mars. It was kept by matrons in particular, and bachelors were entirely excluded from any share in the solemnity. The men during this feast sent presents to the women, for which a return was made.

Matrices
||
Matronalia.

Matrosses made by them at the Saturnalia: And the women gave the same indulgence to their servants now which the men gave to theirs at the feast of Saturn, serving them at table, and treating them as superiors.

MATROSSES, are soldiers in the train of artillery, who are next to the gunners, and assist them in loading, firing, and spunging the great guns. They carry firelocks, and march along with the store-waggons, both as a guard, and to give their assistance in case a waggon should break down.

MATSYS (Quintin), painter of history and portraits, was born at Antwerp in 1460, and for several years followed the trade of a blacksmith or farrier, at least till he was in his 20th year. Authors vary in their accounts of the cause of his quitting his first occupation, and attaching himself to the art of painting. Some affirm, that the first unfolding of his genius was occasioned by the sight of a print which accidentally was shown to him by a friend who came to pay him a visit while he was in a declining state of health from the labour of his former employment, and that by his copying the print with some degree of success, he was animated with a desire to learn the art of painting. Others say, he fell in love with a young woman of great beauty, the daughter of a painter, and they allege that love alone wrought the miracle, as he could have no prospect of obtaining her except by a distinguished merit in the profession of painting: for which reason he applied himself with incessant labour to study and practise the art, till he became so eminent as to be intitled to demand her in marriage, and he succeeded. Whatever truth may be in either of these accounts, it is certain that he appeared to have an uncommon genius; his manner was singular, not resembling the manner of any other master, and his pictures were strongly coloured and carefully finished, but yet they have somewhat dry and hard. By many competent judges it was believed, when they observed the strength of expression in some of his compositions, that if he had studied in Italy to acquire some knowledge of the antiques and the great masters of the Roman school, he would have proved one of the most eminent painters of the Low Countries. But he only imitated ordinary life; and seemed more inclined, or at least more qualified, to imitate the defects than the beauties of nature. Some historical compositions of this master deserve commendation; particularly a descent from the cross, which is in the cathedral at Antwerp; and it is justly admired for the spirit, skill, and delicacy of the whole. But the most remarkable and best known picture of Matsys, is that of the two misers in the gallery at Windsor. He died in 1529. He had a son, *John*; who painted in the same style and manner, but not with a reputation equal to his father; though many of his pictures are sold to unskilful purchasers for the paintings of *Quintin*. His most frequent subject was the representation of misers counting their gold, or bankers examining and weighing it.

MATT, in a ship, is a name given to rope-yarn, junk, &c. beat flat and interwoven; used in order to preserve the yards from galling or rubbing in hoisting or lowering them.

MATTER, in common language, is a word of the same import with *body*, and denotes that which is tan-

gible, visible, and extended; but among philosophers it signifies that substance of which all bodies are composed; and in this sense it is synonymous with the word ELEMENT.

It is only by the senses that we have any communication with the external world; but the immediate objects of sense, philosophers have in general agreed to term *qualities*, which they conceive as inhering in something which is called their *subject* or *substratum*. It is this substratum of sensible qualities which, in the language of philosophy, is denominated *matter*; so that *matter* is not that which we immediately see or handle, but the *concealed subject* or *support* of visible and tangible qualities. What the moderns term *qualities*, was by Aristotle and his followers called *form*; but so far as the two doctrines are intelligible, there appears to be no essential difference between them. From the moderns we learn, that body consists of *matter* and *qualities*; and the Peripatetics taught the same thing, when they said that body is composed of *matter* and *form*.

How philosophers were led to analyse body into matter and form, or, to use modern language, into matter and qualities; what kind of existence they attribute to each; and whether *matter* must be conceived as self-existent or created—are questions which shall be considered afterwards (See METAPHYSICS). It is sufficient here to have defined the term.

MATTHEW, or *Gospel of St MATTHEW*, a canonical book of the New Testament.

St MATTHEW wrote his gospel in Judæa, at the request of those he had converted; and it is thought he began in the year 41, eight years after Christ's resurrection. It was written, according to the testimony of all the ancients, in the Hebrew or Syriac language; but the Greek version, which now passes for the original, is as old as the apostolical times.

St MATTHEW the Evangelist's Day, a festival of the Christian church, observed on September 21st.

St MATTHEW, the son of Alpheus, was also called *Levi*. He was of Jewish original, as both his names discover, and probably a Galilean. Before his call to the apostolate, he was a publican or toll-gatherer to the Romans: an office of bad repute among the Jews, on account of the covetousness and exaction of those who managed it; St Matthew's office particularly consisting in gathering the customs of all merchandize that came by the sea of Galilee, and the tribute that passengers were to pay who went by water. And here it was that Matthew sat at the receipt of custom, when our Saviour called him to be a disciple. It is probable, that, living at Capernaum, the place of Christ's usual residence, he might have some knowledge of him before he was called. Matthew immediately expressed his satisfaction in being called to this high dignity, by entertaining our Saviour and his disciples at a great dinner at his own house, whither he invited all his friends, especially those of his own profession, hoping, probably, that they might be influenced by the company and conversation of Christ. St Matthew continued with the rest of the apostles till after our Lord's ascension. For the first eight years afterwards, he preached in Judæa. Then he betook himself to propagating the gospel among the Gentiles,

Matthew **Mattiæcum.** Gentiles, and chose Ethiopia as the scene of his apostolical ministry; where it is said he suffered martyrdom, but by what kind of death is altogether uncertain. It is pretended, but without any foundation, that Hyrtacus, king of Ethiopia, desiring to marry Iphigenia, the daughter of his brother and predecessor Æglippus, and the apostle having represented to him that he could not lawfully do it, the enraged prince ordered his head immediately to be cut off. Baronius tells us, the body of St Matthew was transported from Ethiopia to Bithynia, and from thence was carried to Salernum in the kingdom of Naples in the year 954, where it was found in 1080, and where duke Robert built a church bearing his name.

St MATTHEW, a town of Spain, in the kingdom of Arragon, seated in a pleasant plain, and in a very fertile country watered with many springs. W. Long. O. 15. N. Lat. 40. 22.

MATTHEW of Paris. See PARIS.

MATTHEW of Westminster, a Benedictine monk and accomplished scholar, who wrote a history from the beginning of the world to the end of the reign of Edward I. under the title of *Flores Historiarum*; which was afterwards continued by other hands. He died in 1380.

St MATTHIAS, an apostle, was chosen instead of Judas. He preached in Judæa and part of Æthiopia, and suffered martyrdom. See the *Acts of the Apostles*, chap. i. There was a gospel published under Matthias's name, but rejected as spurious; as likewise some traditions, which met with the same fate.

St MATTHIAS's Day; a festival of the Christian church, observed on the 24th of February. St Matthias was an apostle of Jesus Christ, but not of the number of the twelve chosen by Christ himself. He obtained this high honour upon a vacancy made in the college of the apostles by the treason and death of Judas Iscariot. The choice fell on Matthias by lot; his competitor being Joseph called *Barfabas*, and surnamed *Justus*. Matthias was qualified for the apostleship, by having been a constant attendant upon our Saviour all the time of his ministry. He was, probably, one of the 70 disciples. After our Lord's resurrection, he preached the gospel first in Judæa. Afterwards it is probable he travelled eastwards, his residence being principally near the irruption of the river Apfarus and the haven Hyflus. The barbarous people treated him with great rudeness and inhumanity; and, after many labours and sufferings in converting great numbers to Christianity, he obtained the crown of martyrdom; but by what kind of death, is uncertain.—They pretend to show the relics of St Matthias at Rome; and the famous abbey of St Matthias near Treves boasts of the same advantage; but doubtless both without any foundation. There was a gospel ascribed to St Matthias; but it was universally rejected as spurious.

MATTIACÆ AQUÆ, or **MATTIACI FONTES**, (anc. geog.), now Wisbaden, opposite to Mentz, in the Weteravia. E. Long. 8. N. Lat. 50. 6.

MATTIACUM, or **MATTIUM**, (anc. geog.), a town of the Mattiaci, a branch of the Catti in Germany. Now Marburg in Hesse. E. Long. 8. 40. N. Lat. 50. 40.

MATTINS, the first canonical hour, or the first part of the daily service, in the Romish church.

MATTHIOLUS (Peter Andrew), an eminent physician in the 16th century, born at Sienna, was well skilled in the Greek and Latin tongues. He wrote learned commentaries on Dioscorides, and other works which are esteemed; and died in 1577.

MATURANTS, in pharmacy, medicines which promote the suppuration of tumors.

MATY (Matthew), M. D. an eminent physician and polite writer, was born in Holland in the year 1718. He was the son of a clergyman, and was originally intended for the church; but in consequence of some mortifications his father met with from the synod, on account of some particular sentiments he entertained about the doctrine of the Trinity, turned his thoughts to physic. He took his degree of M. D. at Leyden; and in 1740 came to settle in England, his father having determined to quit Holland for ever. In order to make himself known, in 1749 he began to publish in French an account of the productions of the English press, printed at the Hague under the name of the *Journal Britannique*. This journal, which continues to hold its rank amongst the best of those which have appeared since the time of Bayle, answered the chief end he intended by it, and introduced him to the acquaintance of some of the most respectable literary characters of the country he had made his own. It was to their active and uninterrupted friendship he owed the places he afterwards possessed. In 1758 he was chosen fellow; and in 1765, on the resignation of Dr Birch, who died a few months after and made him his executor, secretary to the royal society. He had been appointed one of the under librarians of the British museum at its first institution in 1753, and became principal librarian at the death of Dr Knight in 1772. Useful in all these posts, he promised to be eminently so in the last, when he was seized with a languishing disorder, which in 1776 put an end to a life which had been uniformly devoted to the pursuit of science and the offices of humanity. He was an early and active advocate for inoculation; and when there was a doubt entertained that one might have the small-pox this way a second time, tried it upon himself unknown to his family. He was a member of the medical club (with the Drs Parsons, Templeman, Fothergill, Watson, and others), which met every fortnight in St Paul's churchyard. He was twice married, viz. the first time to Mrs Elizabeth Boisragon; and the second to Mrs Mary Deners. He left a son and three daughters. He had nearly finished the *Memoirs of the Earl of Chesterfield*; which were completed by his son-in-law Mr Justamond, and prefixed to that nobleman's *Miscellaneous Works*, 1777, 2 vols 4to.

MATY (Paul Henry), M.A. F. R. S. son of the former, was educated at Westminster and Trinity college Cambridge, and had their travelling fellowship for three years. He was afterwards chaplain to Lord Stormont at Paris in 1771, and soon after vacated his next fellowship by marrying one of the three daughters of Joseph Clark, Esq; sister of the late Captain Charles Clark (who succeeded to the command on the death of Captain Cook). On his father's death in 1776, he succeeded to the office of one of the under librarians of

Mattins
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Maty.

Maty
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Maupertuis.

of the British museum, and was afterwards preferred to a superior department, having the care of the antiquities, for which he was eminently well qualified. In 1776 he also succeeded his father in the office of secretary to the royal society. On the disputes respecting the reinstatement of Dr Hutton in the department of secretary for foreign correspondence 1784, Mr Maty took a warm and distinguished part, and resigned the office of secretary; after which he undertook to assist gentlemen or ladies in perfecting their knowledge of the Greek, Latin, French, and Italian classics. Mr Maty was a thinking conscientious man; and having conceived some doubts about the articles he had subscribed in early life, he never could be prevailed upon to place himself in the way of ecclesiastical preferment, though his connections were amongst those who could have served him essentially in this point; and soon after his father's death he withdrew himself from ministering in the established church, his reasons for which he published in the 47th volume of the *Gent. Magazine*, p. 466. His whole life was thenceforward taken up in literary pursuits. He received 100l. from the duke of Marlborough, with a copy of that beautiful work the *Gemmae Marlburienfes*, of which only 100 copies were worked off for presents; and of which Mr Maty wrote the French account, as Mr Bryant did the Latin. In January 1782 he set on foot a Review of publications, principally foreign, which he carried on, with great credit to himself and satisfaction to the public, for near five years, when he was obliged to discontinue it from ill health. He had long laboured under an asthmatic complaint, which at times made great ravages in his constitution, and at last put a period to his life in Jan. 1787, at the age of 42; leaving behind him one son.—Mr Maty enjoyed a respectable rank in the republic of letters, and by his talents and attainments was fully intitled to it. He was eminently acquainted with ancient and modern literature, and particularly conversant in critical researches. The purity and probity of his nature were unquestionable; and his humanity was as exquisite as it would have been extensive, had it been seconded by his fortune.

MAUCAUCO, MACACO, or *Maki*, in zoology. See LEMUR, n° 4.

MAVIS, in ornithology, a species of *turdus*. See TURDUS.

MAUBEUGE, a town of the Netherlands, in Hainault, with an illustrious abbey of canonesses, who must be noble both by the father and mother's side. This place was ceded to France in 1678; and fortified after the manner of Vauban. It is seated on the river Sambre, in E. Long. 5. 0. N. Lat. 50. 15.

MAUNCH, in heraldry, the figure of an ancient coat sleeve, borne in many gentlemens escutcheons.

MAUNDY THURSDAY, is the Thursday in Passion week; which was called *Maundy* or *Mandate Thursday*, from the command which our Saviour gave his apostles to commemorate him in the Lord's supper, which he this day instituted; or from the new commandment which he gave them to love one another, after he had washed their feet as a token of his love to them.

MAUPERTUIS (Peter Louis Morceau de), a celebrated French academician, was born at St Malo in 1698; and was there privately educated till he arrived

at his 16th year, when he was placed under the celebrated professor of philosophy M. le Blond, in the college of la Marche, at Paris. He soon discovered a passion for mathematical studies, and particularly for geometry. He likewise practised instrumental music in his early years with great success; but fixed on no profession till he was 20, when he entered into the army. He first served in the Grey Mousquetaers; but in the year 1720, his father purchased him a company of cavalry in the regiment of La Rocheguyon. He remained but five years in the army, during which time he pursued his mathematical studies with great vigour; and it was soon remarked by M. Freret and other academicians, that nothing but geometry could satisfy his active soul and unbounded thirst for knowledge. In the year 1723, he was received into the Royal Academy of Sciences, and read his first performance, which was a memoir upon the construction and form of musical instruments, November 15. 1724. During the first years of his admission he did not wholly confine his attention to mathematics; he dived into natural philosophy, and discovered great knowledge and dexterity in observations and experiments upon animals. If the custom of travelling into remote climates, like the sages of antiquity, in order to be initiated into the learned mysteries of those times, had still subsisted, no one would have conformed to it with greater eagerness than M. de Maupertuis. His first gratification of this passion was to visit the country which had given birth to Newton; and during his residence at London he became as zealous an admirer and follower of that philosopher as of any one of his own countrymen. His next excursion was to Basil in Switzerland, where he formed a friendship with the famous John Bernouilli and his family, which continued to his death. At his return to Paris, he applied himself to his favourite studies with greater zeal than ever:—And how well he fulfilled the duties of an academician, may be gathered by running over the memoirs of the academy from the year 1724 to 1736; where it appears that he was neither idle nor occupied by objects of small importance. The most sublime questions in geometry and the relative sciences received from his hands that elegance, clearness, and precision, so remarkable in all his writings. In the year 1736, he was sent by the king of France to the polar circle, to measure a degree in order to ascertain the figure of the earth, accompanied by Messrs Clairault, Camus, Le Monnier, l'Abbé Outhier, and Celsius the celebrated professor of astronomy at Upsal. This distinction rendered him so famous, that, at his return, he was admitted a member of almost every academy in Europe.

In the year 1740 Maupertuis had an invitation from the king of Prussia to go to Berlin; which was too flattering to be refused. His rank among men of letters had not wholly effaced his love for his first profession, namely, that of arms. He followed his Prussian majesty into the field, and was a witness of the dispositions and operations that preceded the battle of Molwitz; but was deprived of the glory of being present, when victory declared in favour of his royal patron, by a singular kind of adventure. His horse, during the heat of the action, running away with him, he fell into the hands of the enemy; and was at first

Maupertuis.

but

Maupertuis.

but roughly treated by the Austrian soldiers, to whom he could not make himself known for want of language; but being carried prisoner to Vienna, he received such honours from their imperial majesties as were never effaced from his memory. From Vienna he returned to Berlin; but as the reform of the academy which the king of Prussia then meditated was not yet mature, he went again to Paris, where his affairs called him, and was chosen in 1742 director of the academy of sciences. In 1743 he was received into the French academy; which was the first instance of the same person being a member of both the academies at Paris at the same time. M. de Maupertuis again assumed the soldier at the siege of Fribourg, and was pitched upon by marshal Cigny and the count d'Argenson to carry the news to the French king of the surrender of that citadel.

He returned to Berlin in the year 1744, when a marriage was negotiated and brought about, by the good offices of the queen-mother, between our author and mademoiselle de Borck, a lady of great beauty and merit, and nearly related to M. de Borck at that time minister of state. This determined him to settle at Berlin, as he was extremely attached to his new spouse, and regarded this alliance as the most fortunate circumstance of his life.

In the year 1746, M. de Maupertuis was declared by his Prussian majesty president of the royal academy of sciences at Berlin, and soon after by the same prince was honoured with the order of Merit: However, all these accumulated honours and advantages, so far from lessening his ardour for the sciences, seemed to furnish new allurements to labour and application. Not a day passed but he produced some new project or essay for the advancement of knowledge. Nor did he confine himself to mathematical studies only: metaphysics, chemistry, botany, polite literature, all shared his attention, and contributed to his fame. At the same time, he had, it seems, a strange inquietude of spirit, with a dark atrabilaire humour, which rendered him miserable amidst honours and pleasures. Such a temperament did not promise a very pacific life; and he was engaged in several quarrels. He had a quarrel with Koenig the professor of philosophy at Franeker, and another more terrible with Voltaire. Maupertuis had inserted into the volume of Memoirs of the Academy of Berlin for 1746, a discourse upon the laws of motion; which Koenig was not content with attacking, but attributed to Leibnitz. Maupertuis, stung with the imputation of plagiarism, engaged the academy of Berlin to call upon him for his proof; which Koenig failing to produce, he was struck out of the academy, of which he was a member. Several pamphlets were the consequence of this; and Voltaire, for some reason or other, engaged against Maupertuis. We say, for some reason or other: because Maupertuis and Voltaire were apparently upon the most amicable terms; and the latter respected the former as his master in the mathematics. Voltaire, however, exerted all his wit and satire against him; and on the whole was so much transported beyond what was thought right, that he found it expedient in 1753 to quit the court of Prussia.

Our philosopher's constitution had long been considerably impaired by the great fatigues of various kinds
N^o 198.

Maupertuis.

in which his active mind had involved him; though from the amazing hardships he had undergone in his northern expedition, most of his future bodily sufferings may be traced. The intense sharpness of the air could only be supported by means of strong liquors; which helped but to lacerate his lungs, and bring on a spitting of blood, which began at least 12 years before he died. Yet still his mind seemed to enjoy the greatest vigour; for the best of his writings were produced, and most sublime ideas developed, during the time of his confinement by sickness, when he was unable to occupy his presidial chair at the academy. He took several journeys to St Malo, during the last years of his life, for the recovery of his health: And though he always received benefit by breathing his native air, yet still, upon his return to Berlin, his disorder likewise returned with greater violence.—His last journey into France was undertaken in the year 1757; when he was obliged, soon after his arrival there, to quit his favourite retreat at St Malo, on account of the danger and confusion which that town was thrown into by the arrival of the English in its neighbourhood. From thence he went to Bourdeaux, hoping there to meet with a neutral ship to carry him to Hamburgh, in his way back to Berlin; but being disappointed in that hope, he went to Toulouse, where he remained seven months. He had then thoughts of going to Italy, in hopes a milder climate would restore him to health; but finding himself grow worse, he rather inclined towards Germany, and went to Neufchatel, where for three months he enjoyed the conversation of Lord Marischal, with whom he had formerly been much connected. At length he arrived at Basil, October 16. 1758, where he was received by his friend Bernouilli and his family with the utmost tenderness and affection. He at first found himself much better here than he had been at Neufchatel: but this amendment was of short duration; for as the winter approached, his disorder returned, accompanied by new and more alarming symptoms. He languished here many months, during which he was attended by M. de la Condamine; and died in 1759.

He wrote in French, 1. The figure of the earth determined. 2. The measure of a degree of the meridian. 3. A discourse on the parallax of the moon. 4. A discourse on the figure of the stars. 5. The elements of geography. 6. Nautical astronomy. 7. Elements of astronomy. 8. A physical dissertation on a white inhabitant of Africa. 9. An essay on cosmography. 10. Reflections on the origin of languages. 11. An essay on moral philosophy. 12. A letter on the progress of the sciences. 13. An essay on the formation of bodies. 14. An eulogium on M. de Montesquieu. 15. Letters, and other works.

MAUR (St), was a celebrated disciple of St Benedict. If we can believe a life of St Maur ascribed to Faustus his companion, he was sent by Benedict on a mission to France. But this life is considered as apocryphal. In rejecting it, however, as well as the circumstances of the mission, we must beware of denying the mission itself. It is certain that it was believed in France as early as the 9th century; and notwithstanding the silence of Bede, Gregory of Tours, and others, there are several documents which prove this, or at least render it extremely probable. A celebrated society

Mauriceau
Maurice.

ciety of benedictines took the name of *St Maur* in the beginning of the last century, and received the sanction of Pope Gregory XV. in 1621. This society was early distinguished by the virtue and the knowledge of its members, and it still supports the character. There are perhaps fewer eminent men in it than formerly: but this must be ascribed to the levity of the age, and partly to the little encouragement for the researches of learned men. The chief persons of ingenuity which this society has produced are, the Fathers Menard, d'Acheri, Mabillon, Ruinart, Germain, Lami, Montfaucon, Martin, Vaissette, le Nourri, Martianay, Martenne, Massuet, &c. &c. See *L'Histoire Lettrée de la Congregation de St Maur*, published at Paris under the title of *Brussels*, in 4to, 1770, by Dom. Tassin.

MAURICEAU (Francis), a French surgeon, who applied himself with great success and reputation to the theory and practice of his art for several years at Paris. Afterwards he confined himself to the disorders of pregnant and lying-in women, and was at the head of all the operators in this way. His *Observations sur la grossesse et sur l'accouchement des femmes, sur leurs maladies, et celles des enfans nouveaux*, 1694, in 4to, is reckoned an excellent work, and has been translated into several languages; German, Flemish, Italian, English: and the author himself translated it into Latin. It is illustrated with cuts. He published another piece or two, by way of supplement, on the same subject; and died at Paris in 1709.

MAURICE (St) commander of the Theban legion, was a Christian, together with the officers and soldiers of that legion, amounting to 6600 men.— This legion received its name from the city Thebes in Egypt, where it was raised. It was sent by Dioclesian to check the Bagaudac, who had excited some disturbances in Gaul. Maurice having carried his troops over the Alps, the emperor Maximinian commanded him to employ his utmost exertions to extirpate Christianity. This proposal was received with horror both by the commander and by the soldiers.— The emperor, enraged at their opposition, commanded the legion to be decimated; and when they still declared that they would sooner die than do any thing prejudicial to the Christian faith, every tenth man of those who remained was put to death. Their perseverance excited the emperor to still greater cruelty; for when he saw that nothing could make them relinquish their religion, he commanded his troops to surround them, and cut them to pieces. Maurice, the commander of these Christian heroes, and Exuperus and Candidus, officers of the legion, who had chiefly instigated the soldiers to this noble resistance, signalized themselves by their patience and their attachment to the doctrines of the Christian religion. They were massacred, it is believed, at Agaune, in Chablais, the 22d of September 286.— Notwithstanding many proofs which support this transaction, Dubordier, Hottinger, Moyle, Burnet, and Mosheim, are disposed to deny the fact. It is defended, on the other hand, by Hickes an English writer, and by Dom Joseph de Lisle a benedictine monk *de la congregation de Saint Vannes*, in a work of his, intitled, *Defence de la Verité du Martyre de la Legion Thebenne*, 1737. In defence of the same fact, the

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reader may consult *Historia di S. Mauritiæ*, by P. Rosignole a Jesuit, and the *Acta Sanctorum* for the month of September. The martyrdom of this legion, written by St Eucherius bishop of Lyons, was transmitted to posterity in a very imperfect manner by Surius. P. Chifflet a Jesuit, discovered, and gave to the public, an exact copy of this work. Don Ruinart maintains, that it has every mark of authenticity. St Maurice is the patron of a celebrated order in the king of Sardinia's dominions, created by Emmanuel Philibert duke of Savoy, to reward military merit, and approved by Gregory XIII. in 1572. The commander of the Theban legion must not be confounded with another *St Maurice*, mentioned by Theodoret, who suffered martyrdom at Apamea, in Syria.

MAURICE (Mauritius Tiberius), was born at Arabissus in Cappadocia, A. D. 539. He was descended from an ancient and honourable Roman family.— After he had filled several offices in the court of Tiberius Constantine, he obtained the command of his armies against the Persians. His gallantry was so conspicuous, that the emperor gave him his daughter Constantina in marriage, and invested him with the purple the 13th August 582. The Persians still continued to make inroads on the Roman territories, and Maurice sent Philippicus, his brother-in-law, against them. This general conducted the war with various success. At first he gained several splendid victories, but he did not continue to have a decided superiority. As there was great use for soldiers in these unfortunate times, the emperor issued a mandate in 592, forbidding any soldier to become a monk till he had accomplished the term of his military service. Maurice acquired much glory in restoring Chosroes II. king of Persia, to the throne, after he had been deposed by his subjects. The empire was in his reign harassed by the frequent inroads of the Arabian tribes. He purchased peace from them by granting them a pension nearly equal to 100,000 crowns; but these barbarians took frequent opportunities to renew the war. In different engagements the Romans destroyed 50,000, and took 17,000 prisoners. These were restored, on condition that the king of the Abari should return all the Roman captives in his dominions. Regardless of his promise, he demanded a ransom of 10,000 crowns. Maurice, full of indignation, refused the sum; and the barbarian, equally enraged, put the captives to the sword. While the emperor, to revenge this cruelty, was making preparations against the Abari, Phocas, who from the rank of a centurion had attained the highest military preferment, assumed the purple, and was declared emperor. He pursued Maurice to Chalcedon, took him prisoner, and condemned him to die. The five sons of this unfortunate prince were massacred before his eyes; and Maurice, humbling himself under the hand of God, was heard to exclaim, *Thou art just, O Lord, and thy judgments are without partiality*. He was beheaded on the 26th November 602, in the 63d year of his age and 20th of his reign. Many writers have estimated the character of this prince by his misfortunes instead of his actions. They believed him guilty without evidence, and condemned him without reason. It cannot be denied, however, that he allowed Italy to be harassed, but he was a father to the rest of the empire. He re-

Maurice.

Maurice. stored the military discipline, humbled the pride of his enemies, supported the Christian religion by his laws, and piety by his example. He loved the sciences, and was the patron of learned men.

MAURICE, elector of Saxony, son of Henry le Pieux, was born A. D. 1521. He was early remarkable for his courage, and during his whole life he was engaged in warlike pursuits. He served under the emperor Charles V. in the campaign of 1544 against France; and in the year following against the league of Smalkalde; with which, although a Protestant, he would have no manner of connection. The emperor, as a reward for his services, in the year 1547, made him elector of Saxony, having deprived his cousin John Frederick of that electorate. Ambition had led him to second the views of Charles, in the hope of being elector, and ambition again detached him from that prince. In 1551 he entered into a league against the emperor, together with the elector of Brandenburg, the Count Palatine, the duke of Wirtemberg, and many other princes. This league, encouraged by the young and enterprising Henry II. of France, was more dangerous than that of Smalkalde. The pretext for the association was the deliverance of the Landgrave of Hesse, whom the emperor kept prisoner. Maurice and the confederates marched, in 1552, to the defiles of Tirol, and put to flight the Imperial troops who guarded them. The emperor and his brother Ferdinand narrowly escaped, and fled from the conquerors in great disorder. Charles having retired into Passau, where he had collected an army, brought the princes of the league to terms of accommodation. By the famous peace of Passau, which was finally ratified the 12th of August 1552, the emperor granted an amnesty without exception to all those who had carried arms against him from the year 1546. The Protestants not only obtained the free exercise of their religion, but they were admitted into the imperial chamber, from which they had been excluded since the victory of Mulberg.—Maurice soon after united himself with the emperor against the Margrave of Brandenburg, who laid waste the German provinces. He engaged him in 1553, gained the battle of Siverhausen, and died of the wounds he had received in the engagement two days after. He was one of the greatest protectors of the Lutherans in Germany, and a prince equally brave and politic. After he had profited by the spoils of John Frederick, the chief of the Protestants, he became himself the leader of the party, and by these means maintained the balance of power against the emperor in Germany.

MAURICE de Nassau, prince of Orange, succeeded to the government of the Low Countries after the death of his father William, who was killed in 1584 by the fanatic Gerard. The young prince was then only eighteen years of age, but his courage and abilities were above his years. He was appointed captain general of the United Provinces, and he reared that edifice of liberty of which his father had laid the foundation. Breda submitted to him in 1590; Zutphen, Deventer, Hulst, Nimeguen, in 1591. He gained several important advantages in 1592, and in the year following he made himself master of Gertrudenburg. When he had performed these splendid services, he returned to the Low Countries by the way

of Zealand. His fleet was attacked by a dreadful tempest, in which he lost forty vessels, and he himself had very nearly perished. His death would have been considered by the Hollanders as a much greater calamity than the loss of their vessels. They watched over his safety with exceeding care. In 1594, one of his guards was accused of an intention to take away his life; and it was generally believed that he was bribed to this service by the enemies of the republic. He fell a sacrifice at Bruges, either to his own fanaticism or to the jealous anxiety of the friends of Maurice. The prince of Orange, increasing in reputation, defeated the troops of the archduke Albert in 1597, and drove the Spaniards entirely out of Holland. In 1600 he was obliged to raise the siege of Dunkirk; but he took ample vengeance on Albert, whom he again defeated in a pitched battle near Newport. Before the action, this great general sent back the ships which had brought his troops into Flanders: *My brethren* (said he to his army), *we must conquer the enemy or drink up the waters of the sea. Determine for yourselves; I have determined I shall either conquer by your bravery, or I shall never survive the disgrace of being conquered by men in every respect our inferiors.* This speech elevated the soldiers to the highest pitch of enthusiasm, and the victory was complete. Rhinberg, Grave, and Ecluse, cities in Flanders, submitted to the conqueror the following year. Maurice, however, not only laboured for the commonwealth, but also for himself. He coveted the sovereignty of Holland, and was opposed in the prosecution of his design by the pensioner Barneveldt. The zeal and activity of this wise republican cost him his life. He was an Arminian; and at this time Maurice defended Gomar against Arminius.—Taking advantage of the general odium under which the Arminians lay, he found means to get Barneveldt condemned in 1619. His death, wholly owing to the cruel ambition of the prince of Orange, made a deep impression on the minds of the Hollanders. The truce with Spain being expired, Spinola laid siege to Breda in 1624, and in six months, by the proper direction of his great talents, though with great slaughter of his troops, he took the place. The prince of Orange, unsuccessful in every attempt to raise the siege, died of vexation in 1625, aged 55 years, with the reputation of the greatest warrior of his time.—“The life of this Stadtholder (says the Abbé Raynal) was almost an uninterrupted series of battles, of sieges, and of victories. Of moderate abilities in every thing else, he shone conspicuous in his military capacity. His camp was the school of Europe, and those who received their military education in his armies augmented, perhaps, the glory of their master.—Like Montecuculi, he discovered inimitable skill in his marches and encampments; like Vauban, he possessed the talent of fortifying places, and of rendering them impregnable; like Eugene, the address of finding subsistence for great armies, in countries barren by nature, or ravaged by war; like Vendome, the happy talent of calling forth, in the moment they became necessary, greater exertions from his soldiers than could reasonably be expected; like Conde, that infallible quickness of eye which decides the fortune of battles; like Charles XII. the art of rendering his troops almost invincible to cold, hunger, and fatigue; like Turenne, the secret of making war with the least possible

Mauritania sible expence of human blood." The Chevalier Folard maintains, that Maurice was the greatest commander of infantry since the time of the Romans. He studied the military art of the ancients, and applied their rules with great exactness in the various occurrences of war. He not only took advantage of the inventions of others, but he enriched the science of war with several improvements. Telescopes were first used by him for a military purpose; and, besides a kind of gallery in conducting a siege, and the plan of blockading a strong place, which were of his invention, he greatly improved the whole art by his method of pushing an attack with great vigour, and of defending, for the greatest length of time, and in the best manner, a place besieged. In short, the many useful things which he practised or invented, placed him in the highest rank among men of a military character. On one occasion, a lady of quality asked him, *who was the first general of the age?* Spinola (replied he) *is the second.* It was his constant practice, during sleep, to have two guards placed by his bedside, not only to defend him in case of danger, but to awake him if there should be the least occasion. The war betwixt Spain and Holland was never carried on with greater keenness and animosity than during his administration.—The Grand Signior, hearing of the vast torrents of blood shed in this contest, thought that a great empire must depend on the decision. The object of so many battles was pointed out to him on a map, and he said coldly, *If it were my business, I would send my pioneers, and order them to cast this little corner of earth into the sea.* Maurice, like many great men, was impatient under contradiction, and too much devoted to women. He was succeeded by Frederic Henry his brother.

MAURITANIA, an ancient kingdom of Africa, bounded on the west by the Atlantic ocean, on the south by Getulia or Lybia Interior, and on the north by the Mediterranean, and comprehending the greater part of the kingdoms of Fez and Morocco.—Its ancient limits are not exactly mentioned by any historian; neither can they now be ascertained by any modern observations, these kingdoms being but little known to Europeans.

This country was originally inhabited by a people called *Mauri*, concerning the etymology of which name authors are not agreed. It is probable, however, that this country, or at least a great part of it, was first called *Phut*, since it appears from Pliny, Ptolemy, and St Jerom, that a river and territory not far from Mount Atlas went by that name. From the Jerusalem Targum it likewise appears, that part of the Mauri may be deemed the offspring of Lud the son of Misraim, since his descendants, mentioned Genesis x. are there called מִרְיָא, *Matri*, or *Mauritani*. It is certain, that this region, as well as the others to the eastward of it, had many colonies planted in it by the Phœnicians. Procopius tells us, that in his time two pillars of white stone were to be seen there, with the following inscription in the Phœnician language and character, upon them: "We are the *Canaanites*, that fled from *Joshua* the son of Nun, that notorious robber." *Ibnu Rachic*, or *Ibnu Raquig*, an African writer cited by Leo, together with Evagrius and Nicephorus Callistus, assert the same thing.

The Mauritaniens, according to Ptolemy, were divided into several cantons or tribes. The *Metagonitæ* were seated near the straits of Hercules, now those of Gibraltar. The *Saccosii*, or *Cocossii*, occupied the coast of the Iberian sea. Under these two petty nations the *Masices*, *Verues*, and *Verbica* or *Vervica*, were settled. The *Salise*, or *Salinsa*, were situated lower, towards the ocean; and, still more to the south, the *Volubiliani*. The *Maurensii* and *Herpiditani* possessed the eastern part of this country, which was terminated by the *Mulucha*. The *Angaucani* or *Jangaucani*, *Nediberes*, *Zagrensi*, *Baniuba*, and *Vacunta*, extended themselves from the southern foot of Ptolemy's Atlas Minor to his Atlas Major. Pliny mentions the *Baniura*, whom Father Hardouin takes to be Ptolemy's *Baniubæ*; and Mela the *Atlantes*, whom he represents as possessed of the western parts of this district.

The earliest prince of Mauritania mentioned in history is Neptune; and next to him were Atlas and Antæus his two sons, both famous in the Grecian fables on account of their wars with Hercules. Antæus, in his contention with that hero, seems to have behaved with great bravery and resolution. Having received large reinforcements of Libyan troops, he cut off great numbers of Hercules's men. But that celebrated commander, having at last intercepted a strong body of Libyans sent to the relief of Antæus, gave him a total overthrow, wherein both he and the best part of his forces were put to the sword. This decisive action put Hercules in possession of Libya and Mauritania, and consequently of the riches of all these kingdoms. Hence came the fable, that Hercules, finding Antæus, a giant of an enormous size with whom he was engaged in single combat, to receive fresh strength as often as he touched his mother earth when thrown upon her, at last lifted him up in the air and squeezed him to death. Hence likewise may be deduced the fable intimating that Hercules took the globe from Atlas upon his own shoulders, overcame the dragon that guarded the orchards of the Hesperides, and made himself master of all the golden fruit there. Bochart thinks that the fable alluded chiefly to naval engagements, wherein Hercules, for the most part, was victorious; though Antæus from time to time received succours by sea. But at last Hercules, coming up with one of his squadrons which had a strong reinforcement on board, made himself master of it, and thus rendered Antæus incapable for the future of making head against him. The same author likewise insinuates, that the notion of Antæus's gigantic stature prevailing for so many centuries amongst the Tingitanians, pointed out the size of the vessels of which his fleets and squadrons were composed. As for the golden apples so frequently mentioned by the old mythologists, they were the treasures that fell into Hercules's hands upon the defeat of Antæus; the Greeks giving the oriental word מָנָא, *riches*, the signification affixed to their own term *ἄννα*, *apples*.

With regard to the age in which Atlas and Antæus lived, the most probable supposition seems to be that of Sir Isaac Newton. According to that illustrious author, Ammon the father of Sefac was the first king of Libya, or that vast tract extending from the borders of Egypt to the Atlantic ocean; the con-

Mauritania quest of which country was effected by Sefac in his father's life-time. Neptune afterwards excited the Libyans to a rebellion against Sefac, and slew him; and then invaded Egypt under the command of Atlas or Antæus, the son of Neptune, Sefac's brother and admiral. Not long after, Hercules, the general of Thebais and Ethiopia for the gods or great men of Egypt, reduced a second time the whole continent of Libya, having overthrown and slain Antæus near a town in Thebais, from that event called *Antea* or *Anteopolis*: this, we say, is the notion advanced by Sir Isaac Newton, who endeavours to prove, that the first reduction of Libya, by Sefac, happened a little above a thousand years before the birth of Christ, as the last, by Hercules, did some few years after. Now, though we do not pretend to adopt every particular circumstance of Sir Isaac Newton's system, yet we cannot forbear observing, that it appears undeniably plain from scripture, that neither the western extremity of Libya, nor even the other parts of that region, could possibly have been so well peopled before the time of David or Solomon, as to have sent a numerous army to invade Egypt. For Egypt and Phœnicia, from whence the greatest part of the ancestors of the Libyans came, and which were much nearer the place from whence the first dispersion of mankind was made, could not themselves have been greatly overstocked with inhabitants any considerable time before the reign of Saul. And that such an invasion happened in the reign of Neptune, or at least of his son Antæus, has been most fully evinced by this most excellent chronologer.

From the defeat of Antæus, nothing remarkable occurs in the history of Mauritania till the times of the Romans, who at last brought the whole kingdom under their jurisdiction; for which see the article **ROME**. With regard to the customs, &c. of this people, it would seem, from what Hyginus insinuates, that they fought only with clubs, till one Belus, the son of Neptune, as that author calls him, taught them the use of the sword. Sir Isaac Newton makes this Belus to have been the same person with Sesostris king of Egypt, who over-ran a great part of the then known world. 2. All persons of distinction in Mauritania went richly attired, wearing much gold and silver in their clothes. They took great pains in cleansing their teeth, and curled their hair in a curious and elegant manner. They combed their beards, which were very long, and always had their nails pared extremely close. When they walked out in any numbers, they never touched one another, for fear of disconcerting the curls into which their hair had been formed. 3. The Mauritanian infantry, in time of action, used shields made of elephants skins, being clad in those of lions, leopards, and bears, which they kept on both night and day. 4. The cavalry of this nation was armed with broad short lances, and carried targets or bucklers, made likewise of the skins of wild beasts. They used no saddles. Their horses were small and swift, had wooden collars about their necks, and were so much under the command of their riders, that they would follow them like dogs. The habit of these horsemen was not much different from that of the foot above-mentioned, they constantly wearing a large tunic of the skins of wild beasts. The Phutæi,

of whom the Mauritanians were a branch, were eminent for their shields, and the excellent use they made of them, as we learn from Homer, Xenophon, Herodotus, and scripture. Nay, Herodotus seems to intimate, that the shield and helmet came from them to the Greeks. 5. Notwithstanding the fertility of their soil, the poorer sort of the Mauritanians never took care to manure the ground, being strangers to the art of husbandry; but roved about the country in a wild savage manner, like the ancient Scythians or Arabes Scenitæ. They had tents, or *mapalia*, so extremely small, that they could scarce breathe in them. Their food was corn, herbage, &c. which they frequently did eat green, without any manner of preparation; being destitute of wine, oil, and all the elegancies as well as many necessaries of life. Their habit was the same both in summer and winter, consisting chiefly of an old tattered, though thick garment, and over it a coarse rough tunic; which answered probably to that of their neighbours the Numidians. Most of them lay every night upon the bare ground; though some of them strewed their garments thereon, not unlike the present African Kabyles and Arabs, who, according to Dr Shaw, use their hykes for a bed and covering in the night. 6. If the most approved reading of Horace may be admitted, the Mauritanians shot poisoned arrows; which clearly intimates, that they had some skill in the art of preparing poisons, and were excellent dartmen. This last observation is countenanced by Herodian and Ælian, who entirely come into it, affirming them to have been in such continual danger of being devoured by wild beasts, that they durst not stir out of their tents or *mapalia* without their darts. Such perpetual exercise must render them exceedingly skilful in hurling that weapon. 7. The Mauritanians sacrificed human victims to their deities, as the Phœnicians, Carthaginians, &c. did.

The country people were extremely rude and barbarous; but those inhabiting cities must undoubtedly have had at least some smattering in the literature of the several nations they deduced their origin from. That the Mauritanians had some knowledge in naval affairs, seems probable, not only from the intercourse they had with the Phœnicians and Carthaginians, as well as the situation of their country; but likewise from Orpheus, or Onomacritus, who asserts them to have made a settlement at the entrance into Cœchis, to which place they came by sea. Magic, sorcery, divination, &c. they appear to have applied themselves to in very early times. Cicero and Pliny say, that Atlas was the inventor of astrology and the doctrine of the sphere, i. e. he first introduced them into Mauritania. This, according to Diodorus Siculus, gave rise to the fable of Atlas's bearing the heavens upon his shoulders. The same author relates, that Atlas instructed Hercules in the doctrine of the sphere and astrology, or rather astronomy, who afterwards brought those sciences into Greece.

MAURITIA, the GINKGO, or *Maiden-hair tree*: A genus of plants belonging to the natural order of Palmæ. The calyx of the male is monophyllous; the corolla monopetalous; with six stamina. It is a native of Japan, where it is also known by the names of *Ginan* and *Itso*. It rises with a long, erect, thick and branched stem, to the size of a walnut-tree. The bark

Mauritius. bark is ash-coloured, the wood brittle and smooth, the pith soft and fungous. The leaves are large, expanded from a narrow bottom into the figure of a maiden-hair leaf, unequally parted, streaked, without fibres or nerves; both surfaces having the same appearance, and supported upon footstalks, which are compressed upon the upper surface, and extended into the substance of the leaf. From the uppermost shoot hang the flowers in long catkins that are filled with the fertilizing powder; and to which succeeds the fruit, adhering to a thick fleshy pedicle, which proceeds from the bosom of the leaves. This fruit is either exactly or nearly round, and of the appearance and size of a damask plum. The substance surrounding the fruit is fleshy, juicy, white, very harsh, and adheres so firmly to the inclosed nut, as not to be separated from it, except by putrefaction. The nut, properly termed *Gineau*, resembles the pistachia nut, especially a Persian species named *bergjes pistai*; but is almost double in size, and of the figure of an apricot stone. The shell is somewhat white, woody, and brittle; and incloses a white loose kernel, having the sweetness of an almond, along with a degree of harshness. These kernels taken after dinner are said to promote digestion, and to give relief in surfeits; whence they never fail to make part of the desert in great feasts and anniversary entertainments.—Many of these plants have been reared by Mr James Gordon at his nursery near Mile-end. They seem to be very hardy, and thrive in this country in the open air.

MAURITIUS, or MAURICE, an island of Africa, about 400 miles east of Madagascar, lying in the latitude of 20 and 21 degrees south. In the beginning of the 16th century it was discovered by the Portuguese, who, knowing that Pliny and other ancient writers had mentioned the island of Cerne in these seas, took it for granted that this must be it; and accordingly we find it styled *Cerne* or *Sirne*, in their maps: but, notwithstanding this, they did not think fit to settle it; and indeed their force was so small, in comparison of the vast dominions they grasped, that it was very excusable. However, according to their laudable custom, they put some hogs, goats, and other cattle upon it, that in case any of their ships either going to the Indies, or returning to Portugal, should be obliged to touch there, they might meet with refreshments. The Dutch, in the second voyage they made to the East Indies under their admiral James Cornelius Vanneck, came together with five ships on the 15th of September 1568; anchored in a commodious port, to which they gave the name of *Warwick Haven*; and gave a very good account of the place in their journals. Captain Samuel Castleton, in the *Pearl*, an English East India ship, arrived there on the 27th of March 1612; and taking it to be an island undiscovered before, bestowed upon it the name of *England's Forest*, though others of his crew called it *Pearl-Island*, and in the account of their voyage, written by John Tatton the master of the ship, celebrated it as a place very convenient for shipping, either outward or homeward bound, to refresh at. This they sometimes accordingly did, and brought some cargoes of ebony and rich wood from thence, but without fixing any settlement.

At length, in 1638, the Dutch seated themselves

here; and it is highly remarkable, that at the very time they were employed in making their first settlement, the French sent a vessel to take possession of it, who found the Dutch before-hand with them, and refused the assistance of an English Indiaman, wooding and watering in another port of the island, who very frankly offered it, to drive the Dutch from their half-settled posts. They continued for some time in quiet possession of the places they fortified in this island, to which they gave the name of *Mauritius*. But having engaged the French, who were settled on Madagascar, to steal 50 of the natives, and sell them for slaves, for the improvement of the Dutch settlements here, this proved the ruin of both colonies: for the negroes surprised and massacred the French in Madagascar; and the slaves in Mauritius fled into the centre of the island; from whence they so much and so incessantly molested those who had been formerly their masters, that they chose to quit a country where they could no longer remain in any tolerable degree of safety. The East India company, however, from motives of convenience, and a very imperfect notion of its value, disapproved this measure, and therefore ordered it to be resettled; which was accordingly done, and three forts erected at the principal havens. Things now went on somewhat better than they did before; but they were still very much disturbed by the revolted negroes in the heart of the isle, whom they could never subdue. One principal use that the company made of this place, was to send thither state-prisoners, who, as they were not men of the best morals, quickly corrupted the rest of the inhabitants, and rendered them such a race of outrageous smugglers, the situation of the place concurring with their bad dispositions, that, after various ineffectual attempts made to reform them, orders were at length given to abandon Mauritius a second time, which, after some delays, were put in execution in the year 1710.

Two years after this, the French took possession of it, and named it the *Isle de France*. This name has obtained among themselves, but the Europeans in general continue to call it Mauritius. It lies in S. Lat. 20. 15. E. Lon. 6. 15. The inconveniences arising from the want of a port at the island of Bourbon, induced the French to take possession of Mauritius, it having two very good harbours, to fortify which no expence has been spared. That on the north-west is called *Port Louis*, that on the south-east side of the island is called *Port Bourbon*. The trade-wind from the south-east in these latitudes blows all the year round, excepting for a few days at the summer solstice, when it is interrupted by hard gales and hurricanes from the north. The ease with which this wind enables ships to enter the port of Bourbon, caused the French, when they first took possession of this spot, to esteem it the best port in the island; but experience pointing out to them, that the same wind often rendered the passage out of the harbour so difficult, that a ship was sometimes obliged to wait a considerable time before the weather admitted of her putting to sea, this harbour is in a great measure abandoned, and the principal town and seat of government is now fixed at port Louis, which is nearly in the middle of the north side of the island, and its entrance is through a channel formed by two shoals, which advance about two miles into

the

Mauritius. the sea. When a ship arrives opposite to this channel, the south-east wind hinders her from entering the port under sail, and she must either warp in with cables or be towed in with boats. The necessity of this operation, joined to the extreme narrowness of the channel, which does not admit of two ships abreast of each other entering at the same time, is one of the best defences the harbour has against an attack by sea; for, from these obstacles, an enemy would find it a matter of the greatest difficulty to force the port; and in addition to this natural strength, they have built two forts and as many batteries, which are mounted with heavy cannon, and entirely command the approach to the harbour, should ships presume to force an entry under sail. This port is capable of containing 100 sail of ships, and is well provided with every requisite for repairing and even building of ships. This port has proved of the greatest advantage to France in the several wars which have been carried on between Great Britain and her; and has proved of great utility to the French East India company's commerce; for here their ships and crews were sure to meet with all necessary refreshment after a long voyage. The port of Bourbon is also fortified; and an army landed here would find it an extreme difficult task to pass the mountains to the different parts of the island. There are several places between the north-east extremity and port Louis where boats may land, but all these are defended by batteries; and the country behind them is a continued thicket: The rest of the coast is inaccessible. In the north-eastern quarter is a plain extending about 10 miles from east to west, and in some places five miles inland from the northern coast. All the rest of the island is full of high and steep mountains, lying so near to one another, and the intervals between them so narrow, that, instead of valleys, they rather resemble the beds of torrents; and these are choaked with huge fragments of rocks which have fallen from the steep sides of the impending mountains. On the summits of the mountains ice is frequently to be found, and they are covered with forests of ebony and other large trees. The ground they shade produces herbage, shrubs, and plants of various sorts, from the common grass to the strongest thorn, and that in such profusion, that they form a thicket so closely interwoven, that no progress can be made but by means of a hatchet. Notwithstanding these difficulties, plantations have been formed on these mountains, and very considerable progress has been made in the plains; but the productions, although mostly of the same kind, are not only in less quantity, but of an inferior quality to those produced at Bourbon island.

In a course of years, however, this settlement cost so much, and was considered in every light worth so little, that it had been more than once under deliberation, whether, after the example of the Dutch, they should not leave it again to its old negro inhabitants; which sooner or later in all likelihood would have been its fate, if, in 1735, the famous M. de la Bourdonnais had not been sent thither, with the title of *governor-general of the French islands*.

He found this isle in the worst state possible, thinly inhabited by a set of lazy people, who equally hated

industry and peace, and who were continually flatter-*Mauritius* ing this man to his face, and belying him wherever and as far as they durst. He gave himself no trouble about this, having once found the means to make himself obeyed; he saw the vast importance of the island; he conceived that it might be settled to great advantage; and, without so much as expecting the thanks of those for whom he laboured, he began to execute this great design. His first step was to bring over black boys from Madagascar, whom he carefully trained up in good principles, and in continual exercise; by which he rendered them so good soldiers, that he very quickly obliged the Marones, or wild negroes, either to submit or to quit the island: he taught the planters to cultivate their lands to advantage; he, by an aqueduct, brought fresh water to the sea-side; and whereas they had not so much as a boat at his coming thither, he made a very fine dock, where he not only built sloops and larger vessels, but even a ship of the burden of 500 ton. However incredible it may seem, yet it is certainly fact, that in the space of five years he converted this country into a paradise, that had been a mere wilderness for 5000; and this in spite of the inhabitants, and of the company, who being originally prejudiced by them, behaved ill to him at his return. He soon made the cardinal de Fleury, however, sensible of the true state of things; and compelled the company to acknowledge, though they did not reward, his services. He afterwards returned into the Indies, and perfected the work he had begun, and to him it is owing that the isle of France was rendered one of the finest and most important spots upon the globe. Here no coffee is raised; but by the indefatigable industry of M. de Bourdonnais, sugar, indigo, pepper, and cotton (which are not at Bourbon), came to be cultivated with success. Since the departure of that most excellent governor, the plantations have been neglected, and are fallen off; but if a proper spirit of activity was raised among the inhabitants, they might soon be made to resume their flourishing appearance. Mines of iron have been discovered in the mountains near the great plain, in the north-east part of the island; and these mountains affording in great abundance the necessary fuel, forges have been erected: but the iron produced is of a very inferior quality, it being brittle, and only fit for making cannon-balls and bomb-shells. Black cattle, sheep, and goats, are preserved with difficulty; the first generally die before they have been a year in the island, and this occasions frequent importations of them from Madagascar and other parts. Common domestic poultry breed in great plenty; and, with fish and turtle, furnish a great part of the food of the European inhabitants.

The approach to the island is extremely dangerous, it being surrounded with ledges of rocks, and many of them covered by the sea. The shore abounds with coral and shells. This island is said to contain 60 rivers: some are considerable streams, and most of them have their sources from lakes, of which there are several in the middle part of the island. The rivers afford plenty of various kinds of fish, particularly eels. These are of an enormous size, some having been found that were six feet long, and six inches in circumference, and so extremely voracious, that it is dangerous to bathe

Maurua bathe in those parts of the river where they lie, as they will seize a man without fear, and have strength sufficient to keep him under water till he is drowned. Here is a great variety of birds, and bats as large as a young kitten: the inhabitants esteem them a delicate morsel. The air is both hot and moist, but not unwholesome. The place abounds with insects, which are very troublesome; but there are no serpents. It has been discovered, that off Port Louis the south-east wind generally blows with least strength about sun-rise; and it also happens, on four or five days, at intervals, in the course of a month, that early in the morning the wind ceases in the northern part of the island for an hour or two, when a breeze rises, although but faintly, from the north-west; during which, a ship stationed at the entrance of the channel to avail herself of this breeze, may enter the harbour and attack the forts.

MAURUA, one of the Society-Islands in the South Sea. It is a small island, entirely surrounded with a ridge of rocks, and without any harbour for shipping. It is inhabited; and its productions are the same with those of the neighbouring islands. A high round hill rises in the middle of it, which may be seen at the distance of 10 or 12 leagues.

MAUSOLEUM, a magnificent tomb or funeral monument. The word is derived from Mausolus king of Caria, to whom Artemisia his widow erected a most stately monument, esteemed one of the wonders of the world, and called it, from his own name, *Mausoleum*.

ST MAWES, a town of Cornwall, in England, seated on the east side of Falmouth haven, in W. Long. 5. 26. N. Lat. 50. 30. Though but a hamlet of the parish of St Just, two miles off, without a minister, or either church, chapel, or meeting-house, it has sent members to parliament ever since 1562, who are returned by its mayor or portreeve. It consists but of one street, under a hill, and fronting the sea, and its inhabitants subsist purely by fishing. King Henry VIII. built a castle here, over against Pendennis, for the better security of Falmouth haven. It has a governor, a deputy, and two gunners, with a platform of guns. Here is a fair the Friday after St Luke's day.

MAXENTIUS (Marcus Aurelius Valerius), a son of the emperor Maximianus Hercules, was, by the voluntary abdication of Dioclesian, and of his father, raised to the empire, A. D. 306. He afterwards incited his father to re-assume his imperial authority; and in a perfidious manner destroyed Severus, who had delivered himself into his hands, and relied upon his honour for the safety of his life. His victories and successes were impeded by Galerius Maximianus, who opposed him with a powerful force. The defeat and voluntary death of Galerius soon restored peace to Italy; and Maxentius passed into Africa, where he rendered himself odious by his cruelty and oppression. He soon after returned to Rome, and was informed that Constantine was come to dethrone him. He gave his adversary battle near Rome, and, after he had lost the victory, he fled back to the city. The bridge over which he crossed the Tiber was in a decayed situation, and he fell into the river, and was drowned, A. D. 312. The cowardice and luxuries of Maxentius were as conspicuous as his cruelties. He

oppressed his subjects with heavy taxes, to gratify the cravings of his pleasures, or the avarice of his favourites. He was debauched in his manners, and neither virtue nor innocence were safe whenever he was inclined to voluptuous pursuits. His body was deformed, and unwieldy. To visit a pleasure ground, or to exercise himself under a marble portico, or walk on a shady terrace, was to him a Herculean labour, which required the greatest exertions of strength and resolution.

MAXILLA, the JAW. See *ANATOMY*, n° 20—26.

MAXIM, an established proposition or principle; in which sense it denotes much the same with axiom.

MAXIMILIAN I. emperor of Germany, signified himself against the French while he was king of the Romans, and after he was emperor entered into the army of Henry VIII. of England as a volunteer against that nation: he was a protector of learned men, and abolished an iniquitous tribunal, styled *Judicium oculum Westphalie*: he composed some poems, and the memoirs of his own life. He died in 1519, aged 60.

MAXIMUM, in mathematics, denotes the greatest quantity attainable in any given case.

If a quantity conceived to be generated by motion increases or decreases till it arrives at a certain magnitude or position, and then, on the contrary, grows greater or lesser, and it be required to determine the said magnitude or position, the question is called a *problem de maximis et minimis*.

MAXIMUS, a celebrated Cynic philosopher, and magician of Ephesus. He instructed the emperor Julian in magic; and, according to the opinion of some historians, it was in the conversation and company of Maximus that the apostacy of Julian originated. The emperor not only visited the philosopher, but he even submitted his writings to his inspection and censure. Maximus refused to live in the court of Julian, and the emperor, not dissatisfied with the refusal, appointed him high pontiff in the province of Lydia, an office which he discharged with the greatest moderation and justice. When Julian went into the east, the philosopher promised him success, and even said that his conquests would be more numerous and extensive than those of the son of Philip. He persuaded his imperial pupil, that, according to the doctrine of Metempsychosis, his body was animated by the soul which once animated the hero whose greatness and victories he was going to eclipse. After the death of Julian, Maximus was almost sacrificed to the fury of the soldiers; but the interposition of his friends saved his life, and he retired to Constantinople. He was soon after accused of magical practices, before the emperor Valens, and beheaded at Ephesus, A. D. 366. He wrote some philosophical and rhetorical treatises, some of which were dedicated to Julian. They are all now lost.

MAXIMUS of Tyre, a Platonic philosopher, went to Rome in 146, and acquired such reputation there, that the emperor Marcus Aurelius became his scholar, and gave him frequent proofs of his esteem. This philosopher is thought to have lived till the reign of the emperor Commodus. There are still extant 41 of his dissertations; a good edition of which was printed by Daniel

Maxilla
||
Maximus.

Maximus, Daniel Heinsius, in 1624, in Greek and Latin, with notes.

MAXIMUS MARIUS. See *MARIUS*.

MAXIMUS (St), an abbot and confessor of the 7th century, was of a noble family of Constantinople, and distinguished himself by his zeal against the Monothelites, for which he was thrown into prison, and died there on the 13th of August 1662. He wrote a Commentary on the books attributed to Dionysius the Areopagite, and several other works, of which an edition has been published by father Combefis.

MAY, the fifth month in the year, reckoning from our first, or January; and the third, counting the year to begin with March, as the Romans anciently did. It was called Maius by Romulus, in respect to the senators and nobles of his city, who were named *majores*; as the following month was called *Junius*, in honour of the youth of Rome, in *honorem juniorum*, who served him in the war; though some will have it to have been thus called from *Maia*, the mother of Mercury, to whom they offered sacrifice on the first day of it; and Papias derives it from *Madius*, *eo quod tunc terra madaat*. In this month the sun enters Gemini, and the plants of the earth in general begin to flower.—The month of May has ever been esteemed favourable to love; and yet the ancients, as well as many of the moderns, look on it as an unhappy month for marriage. The original reason may perhaps be referred to the feast of the Lemures, which was held in it. Ovid alludes to this in the fifth of his *Fasti*, when he says,

*Nec viduae tædis eadem, nec virginis apta
Tempora; quæ nupsit, non diuturna fuit;
Hac quoque de causa, si te proverbia tangunt,
Mense malum Maio nubere vulgus ait.*

MAY-dew. See *DEW*.

MAY-duke, a species of cherry. See *PRUNUS*.

MAY (Isle of), a small island at the mouth of the Frith of Forth, in Scotland, about a mile and an half in circumference, and seven miles from the coast of Fife, almost opposite to the rock called the *Bass*. It formerly belonged to the priory of Pittenweem; and was dedicated to St Adrian, supposed to have been martyred in this place by the Danes; and hither, in times of Popish superstition, barren women used to come and worship at his shrine, in hopes of being cured of their sterility. Here is a tower and light-house built by Mr Cunningham of Barns, to whom king Charles I. granted the island in fee, with power to exact two-pence per ton from every ship that passes, for the maintenance of a light-house. In the middle of it there is a fresh-water spring, and a small lake. The soil produces pasturage for 100 sheep and 20 black cattle. On the west side the steep rocks render it inaccessible; but to the east there are four landing-places and good riding. It was here that the French squadron, having the chevalier de St George on board, anchored in the year 1708, when the vigilance of Sir George Byng obliged him to relinquish his design, and bear away for Dunkirk. The shores all round the island abound with fish, and the cliffs with water-fowl.

MAY (Thomas), an eminent English poet and historian in the 17th century, was born of an ancient but decayed family in Suffex, educated at Cambridge, and N^o 198.

afterwards removed to London, where he contracted a friendship with several eminent persons, and particularly with Endymion Porter, Esq; one of the gentlemen of the bed-chamber to king Charles I. While he resided at court, he wrote the five plays now extant under his name. In 1622, he published a translation of Virgil's *Georgics*, with annotations; and in 1635 a poem on king Edward III. and a translation of Lucan's *Pharsalia*, which poem he continued down to the death of Julius Cæsar, both in Latin and English verse. Upon the breaking out of the civil wars he adhered to the parliament; and in 1647, he published, "The history of the parliament of England, which began November the third MDCXL. With a short and accessary view of some precedent years." In 1649, he published, *Historiæ parliamenti Angliæ Breviarium*, in three parts; which he afterwards translated into English. He wrote the History of Henry II. in English verse. He died in 1652. He went well to rest over-night, after a cheerful bottle as usual, and died in his sleep before morning: upon which his death was imputed to his tying his night-cap too close under his fat cheeks and chin, which caused his suffocation; but the facetious Andrew Marvel has written a poem of 100 lines, to make him a martyr of Bacchus, and die by the force of good wine. He was interred near Camden, in Westminster-Abbey; which caused Dr Fuller to say, that "if he were a biassed and partial writer, yet he lieth buried near a good and true historian indeed." Soon after the restoration, his body, with those of several others, was dug up, and buried in a pit in St Margaret's church-yard; and his monument, which was erected by the appointment of Parliament, was taken down and thrown aside.

MAYER (Tobias), one of the greatest astronomers and mechanics this century has produced, was born at Maspach, in the duchy of Wirtemberg 1723. He taught himself mathematics, and at the age of fourteen designed machines and instruments with the greatest dexterity and justness. These pursuits did not hinder him from cultivating the belles lettres. He acquired the Latin tongue, and wrote it with elegance. In 1750, the university of Gottingen chose him for their mathematical professor; and every year of his short life was thenceforward marked with some considerable discoveries in geometry and astronomy. He published several works in this way, which are all reckoned excellent; and some are inserted in the second volume of the "Memoirs of the university of Gottingen." His labours seem to have exhausted him; for he died worn out in 1762.

MAYERNE (Sir Theodore de), baron of Aulbone, was the son of Lewis de Mayerne, the celebrated author of *The general history of Spain*, and of the *Monarchie aristo-démocratique*, dedicated to the states-general. He was born in 1573, and had for his godfather Theodore Beza. He studied physic at Montpellier, and was made physician in ordinary to Henry IV. who promised to do great things for him provided he would change his religion. James I. of England invited him over, and made him first physician to himself and his queen, in which office he served the whole royal family to the time of his death in

1655.

Mayhem 1655. His works were printed at London in 1700, and make a large folio, divided into two books; the first containing his *Consilia, Epistolæ, & Observationes*; the second his *Pharmacopeia varietate medicamentorum formula*.

MAYHEM. See MAIM.

MAYNE (Jasper), an eminent English poet and divine in the 17th century, who was bred at Oxford, and entered into holy orders. While his majesty resided at Oxford, he was one of the divines appointed to preach before him. He published in 1647 a piece intitled, *OXAOMAXIA, or, The people's war examined according to the principles of reason and scripture, by Jasper Mayne*. In 1648 he was deprived of his studentship at Christ-church, and two livings he had; but was restored with the king, who made him his chaplain and archdeacon of Chichester; all which he held till he died. Dr Mayne was held in very high esteem both for his natural parts and his acquired accomplishments. He was an orthodox preacher, and a man of severe virtue and exemplary behaviour; yet of a ready and facetious wit, and a very singular turn of humour. From some stories that are related of him, he seems to have borne some degree of resemblance in his manner to the celebrated Dr Swift; but if he did not possess those very brilliant parts that distinguished the Dean, he probably was less subject to that capricious and those unaccountable whimsies which at times so greatly eclipsed the abilities of the latter. Yet there is one anecdote related of him, which, although it reflects no great honour on his memory, as it seems to carry some degree of cruelty with it, yet is it a strong mark of his resemblance to the Dean, and a proof that his propensity for drollery and joke did not quit him even in his latest moments. The story is this: The doctor had an old servant, who had lived with him some years, to whom he had bequeathed an old trunk, in which he told him he would find *something that would make him drink after his death*. The servant, full of expectation that his master, under this familiar expression, had left him somewhat that would be a reward for the assiduity of his past services, as soon as decency would permit flew to the trunk; when behold, to his great disappointment, the boasted legacy proved to be a red herring. The doctor, however, bequeathed many legacies by will to pious uses; particularly 50 pounds towards the rebuilding of St Paul's cathedral, and 200 pounds to be distributed to the poor of the parishes of Cassington and Pyrton, near Watlington, of both which places he had been vicar. In his younger years he had an attachment to poetry; and wrote two plays, the latter of which may be seen in the tenth volume of Dodsley's collection, viz. 1. *Amorous war*, a tragic-comedy. 2. *The city-match*, a comedy. He published a poem upon the naval victory by the duke of York over the Dutch, printed in 1665. He also translated into English from the Greek part of Lucian's Dialogues.

MAYNOOTH, or MANOOTH, a post town in the county of Kildare, and province of Leinster, in Ireland, near 12 miles from Dublin. Though not very large, it is regularly laid out, and consists of good houses. Here is a charter-school, which was opened 27th July 1759.

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MAYNWARING (Arthur), an eminent political writer in the beginning of the 18th century, staid several years at Oxford, and then went to Cheshire, where he lived some time with his uncle Mr Francis Cholmondley, a very honest gentleman, but extremely averse to the government of king William III. to whom he refused the oaths. Here he prosecuted his studies in polite literature with great vigour; and coming up to London, applied to the study of the law. He was hitherto very zealous in anti-revolutional principles, and wrote several pieces in favour of king James II.; but upon being introduced to the duke of Somerset and the earls of Dorset and Burlington, began to entertain very different notions in politics. His father left him an estate of near 800 l. a-year, but so incumbered, that the interest money amounted to almost as much as the revenue. Upon the conclusion of the peace he went to Paris, where he became acquainted with Mr Boileau. After his return he was made one of the commissioners of the customs, in which post he distinguished himself by his skill and industry. He was a member of the kit-cat-club, and was looked upon as one of the chief supports of it by his pleasantry and wit. In the beginning of queen Anne's reign, the lord treasurer Godolphin engaged Mr Done to quit the office of auditor of the imprests, and made Maynwarding a present of a patent for that office worth about 2000 l. a-year in a time of business. He had a considerable share in the Medley, and was author of several other pieces. The Examiner, his antagonist in politics, allowed that he wrote with tolerable spirit, and in a masterly style. Sir Richard Steele dedicated the first volume of the Tatler to him.

MAYO, one of the Cape de Verd islands, lying in the Atlantic ocean, near 300 miles from Cape Verd in Africa, about 17 miles in circumference. The soil in general is very barren, and water scarce; however, they have some corn, yams, potatoes, and plantains, with plenty of bees, goats, and asses. What trees there are, grow on the sides of the hills, and they have some figs and water-melons. The sea round about the island abounds with fish. The chief commodity is salt, with which many English ships are loaded in the summer-time. The principal town is Pinosa, inhabited by negroes, who speak the Portuguese language, and are stout, lusty, and fleshy. They are not above 200 in number, and many of them go quite naked. W. Long. 21. 25. N. Lat. 15. 5.

MAYO, a county of Ireland, in the province of Connaught, having Sligo and the sea on the north, Roscommon on the south, Leitrim and Roscommon on the east, and the Atlantic ocean on the west. It contains 724,640 Irish plantation acres, 73 parishes, 9 baronies, and one borough; and sends four members to parliament. It gives title of earl to the family of Bourke. This county takes its name from an ancient city, built in 664; the ruins of the cathedral, and some traces of the stone walls which encompassed the city, yet remain on the plains of Mayo. It was a university, founded for the education of such of the Saxon youths as were converted to the Christian faith: it was situated a little to the south of Lough Conn; and is to this day frequently called *Mayo of the Saxons*, being celebrated for giving education to Alfred the great king of England. As this town has

Maynwarding.
Mayo.

Mayor.

gone to decay, Balinrobe is reckoned the chief town. The county by the sea is mountainous; but inland has good pastures, lakes, and rivers. It is about 57 miles long, and 48 broad. Castlebar is the assizes town.— Mayo was formerly a bishop's see, which is now united to TUAM.

MAYOR, the chief magistrate of a city or town, chosen annually out of the aldermen. The word, anciently wrote *meyr*, comes from the British *miret*, i. e. *custodire*, or from the old English *maier*, viz. *poteſtus*, and not from the Latin *major*. King Richard I. in 1189, changed the bailiff of London into a mayor, and from that example king John made the bailiff of King's Lynn a mayor anno 1204: Though the famous city of Norfolk obtained not this title for its chief magistrate till the seventh year of king Henry V. anno 1419; since which there are few towns of note but have had a mayor appointed for government.

Mayors of corporations are justices of peace *pro tempore*, and they are mentioned in several statutes; but no person shall bear any office of magistracy concerning the government of any town, corporation, &c. who hath not received the sacrament according to the church of England within one year before his election, and who shall not take the oaths of supremacy, &c.

If any person intrudes into the office of mayor, a *quo warranto* lies against him, upon which he shall not only be ousted, but fined. And no mayor, or person holding an annual office in a corporation for one year, is to be elected into the same office for the next; in this case, persons obstructing the choice of a successor are subject to 100 l. penalty. Where the mayor of a corporation is not chosen on the day appointed by charter, the next office in place shall the day after hold a court and elect one; and if there be a default or omission that way, the electors may be compelled to choose a mayor, by a writ of mandamus out of the king's bench. Mayors, or other magistrates of a corporation, who shall voluntarily absent themselves on the day of election, are liable to be imprisoned, and disqualified from holding any office in the corporation.

MAYOR'S COURTS. To the lord mayor and city of London belong several courts of judicature. The highest and most ancient is that called the *hustings*, destined to secure the laws, rights, franchises, and customs of the city. The second is a court of *request*, or of *conscience*; of which before. The third is the court of the lord mayor and aldermen, where also the sheriffs sit: to which may be added two courts of sheriffs and the court of the city orphans, whereof the lord mayor and aldermen have the custody. Also the court of common council, which is a court or assembly, wherein are made all by-laws which bind the citizens of London. It consists, like the parliament, of two houses: an upper, consisting of the lord mayor and aldermen; and a lower, of a number of common council men, chose by the several wards, as representatives of the body of the citizens. In the court of common council are made laws for the advancement of trade, and committees yearly appointed, &c. But acts made by them are to have the assent of the lord mayor and aldermen, by stat. 11 Geo. I. Also the chamberlain's

court, where every thing relating to the rents and revenues of the city, as also the affairs of servants, &c. are transacted. Lastly, to the lord mayor belong the courts of coroner and of escheator; another court for the conservation of the river Thames; another of gaol-delivery, held usually eight times a year, at the Old Bailey, for the trial of criminals, whereof the lord mayor is himself the chief judge. There are other courts called *wardmotes* or meetings of the wards; and courts of halymote or assemblies of the several guilds and fraternities.

MAZA, among the Athenians, was a sort of cake made of flour boiled with water and oil, and set, as the common fare, before such as were entertained at the public expence in the common hall or *prytaneum*.

MAZAGAN, a strong place of Africa, in the kingdom of Morocco, and on the frontiers of the province of Duguela. It was fortified by the Portuguese, and besieged by the king of Morocco with 200,000 men in 1562, but to no purpose. It is situated near the sea. W. Long. 7. 45. N. Lat. 33. 5.

MAZARA, an ancient town of Sicily, and capital of a considerable valley of the same name, which is very fertile, and watered with several rivers. The town is a bishop's see, and has a good harbour; is seated on the sea coast, in E. Long. 12. 39. N. Lat. 37. 42.

MAZARINE (Julius), a famous cardinal and prime minister of France, was born at Piscina in the province of Abruzzo, in Naples, in 1602. After having finished his studies in Italy and Spain, he entered into the service of cardinal Sachetts, and became well skilled in politics, and in the interests of the princes at war in Italy; by which means he was enabled to bring affairs to an accommodation, and the peace of Queiras was shortly concluded. Cardinal Richelieu being taken with his conduct, did from thenceforward highly esteem him; as did also cardinal Antonio, and Louis XIII. who procured him a cardinal's hat in 1641. Richelieu made him one of the executors of his will; and during the minority of Louis XIV. he had the charge of affairs. At last he became the envy of the nobility, which occasioned a civil war; whereupon Mazarine was forced to retire, a price was set on his head, and his library sold. Notwithstanding he afterwards returned to the court in more glory than ever; concluded a peace with Spain, and a marriage treaty betwixt the king and the infant. This treaty of peace passes for the masterpiece of cardinal de Mazarine's politics, and procured him the French king's most intimate confidence: but at last his continual application to business threw him into a disease, of which he died at Vincennes in 1661.—Cardinal Mazarine was of a mild and affable temper. One of his greatest talents was his knowing mankind, and his being able to adapt himself, and to assume a character conformable to the circumstances of affairs. He possessed at one and the same time the bishopric of Metz, and the abbey of St Arnould, St Clement, and St Vincent, in the same city; that of St Dennis, Clugny, and Victor, of Marseilles; of St Michael at Soissons, and a great number of others. He founded Mazarine-college at Paris, which is also called the *college of the four nations*. There has been published a collection of his letters, the most copious

Maza
||
Mazarine.

Mazzuoli, copious edition of which is that of 1745, in 2 vols duodecimo.

MAZZUOLI. See PARMIGIANO.

MEAD, a wholesome, agreeable liquor, prepared of honey and water.

One of the best methods of preparing mead is as follows: Into twelve gallons of water slip the whites of six eggs; mixing these well together, and to the mixture adding twenty pounds of honey. Let the liquor boil an hour, and when boiled add cinnamon, ginger, cloves, mace, and a rosemary. As soon as it is cold, put a spoonful of yeast to it, and tun it up, keeping the vessel filled as it works; when it has done working, stop it up close; and, when fine, bottle it off for use.

Thorley says, that mead not inferior to the best of foreign wines may be made in the following manner: Put three pounds of the finest honey to one gallon of water, and two lemon peels to each gallon; boil it half an hour, well scummed; then put in, while boiling, lemon peel: work it with yeast; then put it in your vessel with the peel, to stand five or six months, and bottle it off for use. If it is to be kept for several years, put four pounds to a gallon of water.

The author of the Dictionary of Chemistry directs to choose the whitest, purest, and best-tasted honey, and to put it into a kettle with more than its weight of water: a part of this liquor must be evaporated by boiling, and the liquor scummed, till its consistence is such, that a fresh egg shall be supported on its surface without sinking more than half its thickness into the liquor; then the liquor is to be strained, and poured through a funnel into a barrel; this barrel, which ought to be nearly full, must be exposed to a heat as equable as possible, from 20 to 27 or 28 degrees of Mr Reaumur's thermometer, taking care that the bung-hole be slightly covered, but not closed. The phenomena of the spirituous fermentation will appear in this liquor, and will subsist during two or three months, according to the degree of heat; after which they will diminish and cease. During this fermentation, the barrel must be filled up occasionally with more of the same kind of liquor of honey, some of which ought to be kept a part, on purpose to replace the liquor which flows out of the barrel in froth. When the fermentation ceases, and the liquor has become very vinous, the barrel is then to be put into a cellar, and well closed; a year afterwards the mead will be fit to be put into bottles.

Mead is a liquor of very ancient use in Britain. See the article FEAST, p. 182, col. 1.

MEAD (Dr Richard), a celebrated English physician, was born at Stepney near London, where his father, the Reverend Mr Matthew Mead, had been one of the two ministers of that parish; but in 1662 was ejected for nonconformity, but continued to preach at Stepney till his death. As Mr Mead had a handsome fortune, he bestowed a liberal education upon 13 children, of whom Richard was the eleventh; and for that purpose kept a private tutor in his house, who taught him the Latin tongue. At 16 years of age Richard was sent to Utrecht, where he studied three years under the famous Grævius; and then choosing the profession of physic, he went to Leyden, where he attended the lectures of the famous Pitcairn

on the theory and practice of medicine, and Hermon's botanical courses. Having also spent three years in these studies, he went with his brother and two other gentlemen to visit Italy, and at Padua took his degree of doctor of philosophy and physic in 1695. Afterwards he spent some time at Naples and at Rome; and returning home the next year, settled at Stepney, where he married, and practised physic, with a success that laid the foundation of his future greatness.

In 1703, Dr Mead having communicated to the Royal Society an analysis of Dr Bonomo's discoveries relating to the cutaneous worms that generate the itch, which they inserted in the Philosophical Transactions; this, with his account of poisons, procured him a place in the Royal Society, of which Sir Isaac Newton was then president. The same year he was elected physician of St Thomas's hospital, and was also employed by the surgeons to read anatomical lectures in their hall, which obliged him to remove into the city. In 1707 his Paduan diploma for doctor of physic was confirmed by the university of Oxford; and being patronized by Dr Radcliffe, on the death of that famous physician he succeeded him in his house at Bloomsbury-square, and in the greatest part of his business. In 1727 he was made physician to King George II. whom he had also served in that capacity while he was prince of Wales; and he had afterwards the pleasure of seeing his two sons-in-law, Dr Nichols and Dr Wilmot, his coadjutors in that eminent station.

Dr Mead was not more to be admired for the qualities of the head than he was to be loved for those of his heart. Though he was himself a hearty whig, yet, uninfluenced by party-principles, he was a friend to all men of merit, by whatever denomination they might happen to be distinguished. Thus he was intimate with Garth, with Arbuthnot, and with Freind; and long kept up a constant correspondence with the great Boerhaave, who had been his fellow-student at Leyden: they communicated to each other their observations and projects, and never loved each other the less for being of different sentiments. In the mean time, intent as Dr Mead was on the duties of his profession, he had a greatness of mind that extended itself to all kinds of literature, which he spared neither pains nor money to promote. He caused the beautiful and splendid edition of Thuanus's history to be published in 1713, in seven volumes folio: and by his interposition and assiduity, Mr Sutton's invention of drawing foul air from ships and other close places was carried into execution, and all the ships in his majesty's navy provided with this useful machine. Nothing pleased him more than to call hidden talents into light; to give encouragement to the greatest projects, and to see them executed under his own eye. During almost half a century he was at the head of his business, which brought him one year above seven thousand pounds, and for several years between five and six thousand: yet clergymen, and in general all men of learning, were welcome to his advice. His library consisted of 10,000 volumes, of which his Latin, Greek, and oriental manuscripts, made no inconsiderable part. He had a gallery for his pictures and antiquities, which cost him great sums. His reputation, not only as a

Mead.

¹ **Meadow.** physician, but as a scholar, was so universally established, that he corresponded with all the principal literati in Europe: even the king of Naples sent to desire a complete collection of his works; and in return made him a present of the two first volumes of Signior Bajardi, which may be considered as an introduction to the collection of the antiquities of Herculaneum. At the same time that prince invited him to his palace, that he might have an opportunity of showing him those valuable monuments of antiquity; and nothing but his great age prevented his undertaking a journey so suited to his taste. No foreigner of learning ever came to London without being introduced to Dr Mead; and on these occasions his table was always open, and the magnificence of princes was united with the pleasures of philosophers. It was principally to him that the several counties of England and our colonies abroad applied for the choice of their physicians, and he was likewise consulted by foreign physicians from Russia, Prussia, Denmark, &c. He wrote, besides the above works, 1. A Treatise on the Scurvy. 2. *De variolis et morbillis dissertatio.* 3. *Medica sacra: sive de Morbis insignioribus, qui in Bibliis memorantur, Commentarius.* 4. *Monita et Præcepta medica.* 5. A Discourse concerning pestilential contagion, and the methods to be used to prevent it. The works he wrote and published in Latin were translated into English, under the doctor's inspection, by Thomas Stack, M. D. and F. R. S. This great physician, naturalist, and antiquarian, died on the 16th of February 1754.

MEADOW, in its general signification, means pasture or grass-land, annually mown for hay: but it is more particularly applied to lands that are so low as to be too moist for cattle to graze upon them in winter without spoiling the sward.

¹ **When the watering of meadows was first practised in England.** An improvement in agriculture by watering of meadows has of late come into much use, and been found of very considerable importance. In the Monthly Review for October 1788, the editors acknowledge the favour of a correspondent, who informed them, that watering of meadows was practised during the reigns of Queen Elizabeth and James I. A book was written upon the subject by one Rowland Vaughan, who seems to have been the inventor of this art, and who practised it on a very extensive plan in the Golden Valley in Herefordshire. Till this note to the Reviewers appeared, the inhabitants of a village called South-Cerney in Gloucestershire had assumed the honour of the invention to themselves, as we are informed in a treatise upon the subject by the reverend Mr Wright curate of the place. According to a received tradition in that village, watering of meadows has been practised there for about a century, and was introduced by one *Welladvise*, a wealthy farmer in South-Cerney. His first experiment was by cutting a large ditch in the middle of his ground, from which he threw the water over some parts, and allowed it to stagnate in others: but finding this not to answer his expectations, he improved his method by cutting drains and filling up the hollows; and thus he succeeded so well, that his neighbours, who at first had called him a madman, soon changed their opinion, and began to imitate his example.

The advantages which attend the watering of meadows are many and great; not only as excellent crops

of grass are thus raised, but as they appear so early, ² **Meadow.** that they are of infinite service to the farmers for food to their cattle in the spring before the natural grass rises. By watering we have plenty of grass in the beginning of March, and even earlier when the season is mild. The good effects of this kind of grass upon all sorts of cattle are likewise astonishing, especially upon such as have been hardly wintered; and Mr Wright informs us, that the farmers in his neighbourhood, by means of watering their lands, are enabled to begin the making of cheese at least a month sooner than their neighbours who have not the same advantage. Grass raised by watering is found to be admirable for the nurture of lambs; not only those designed for fattening, but such as are to be kept for store: For if lambs when very young are stopped and stinted in their growth, they not only become contracted for life themselves, but in some measure communicate the same diminutive size to their young. The best remedy for preventing this evil is the spring feed from watered meadows; and Mr Wright is of opinion, that if the young of all kinds of farmer's stock were immediately encouraged by plenty of food, and kept continually in a growing state, there would in a few years be a notable change both in the size and shape of cattle in general. Such indeed is the forwardness of grass from watered meadows, that the feed between March and May is worth a guinea per acre; and in June an acre will yield two tons of hay, and the after-math is always worth twenty shillings; and nearly the same quantity is constantly obtained whether the summer be dry or wet. In dry summers also, such farmers as water their meadows have an opportunity of selling their hay almost at any price to their neighbours.

³ Land treated in this manner is continually improving in quality, even though it be mown every year: the herbage, if coarse at first, becomes finer; the soil, if swampy, becomes sound; the depth of its mould is augmented, and its quality meliorated every year. ^{Land constantly improves by watering.} "To these advantages (says Mr Boswell in his treatise upon this subject) another may be addressed to the gentleman who wishes to improve his estate, and whose benevolent heart prompts him to extend a charitable hand to the relief of the industrious poor, and not to idleness and vice: almost the whole of the expence in this mode of cultivation is the actual manual labour of a class of people who have no genius to employ their bodily strength otherwise for their own support and that of their families; consequently, when viewed in this light, the expence can be but comparatively small, the improvement great and valuable."

⁴ As a proof of the above doctrine, Mr Wright adduces an instance of one year's produce of a meadow in his neighbourhood. It had been watered longer than the eldest person in the neighbourhood could remember; but was by no means the best meadow upon the stream, nor was the preceding winter favourable for watering. It contains six acres and an half. The spring-feed was let for seven guineas, and supported near 200 sheep from the 1st of March till the beginning of May: the hay being sold for 30 guineas, and the after-math for six. Another and still more remarkable proof of the efficacy of watering, is, that two of the most skilful watermen of that place were sent to lay out a meadow of seven acres, the whole crop of which was that year sold for

Meadow. two pounds. Though it was thought by many impossible to throw the water over it, yet the skill of the workmen soon overcame all difficulties; and ever since that time the meadow has been let at the rent of three pounds per acre. From manifold experience, our author informs us, that the people in that part of the country are so much attached to the practice of watering, that they never suffer the smallest spring or rivulet to be unemployed. Even those temporary floods occasioned by sudden showers are received into proper ditches, and spread equally over the lands until its fertilizing property be totally exhausted. "Necessity (says he) indeed compels us to make the most of every drop; for we have near 300 acres in this parish, that must all, if possible, be watered; and the stream that affords the water seldom exceeds five yards in breadth and one in depth: therefore we may say, that a scarcity of water is almost as much dreaded by us as by the celebrated inhabitants of the banks of the Nile."

5
The practice of watering ought to be more generally extended.

Considering the great advantages to be derived from the practice of watering meadows, and the many undoubted testimonies in its favour, Mr Wright expresses his surprise that it has not come into more general use, as there is not a stream of water upon which a mill can be erected but what may be made subservient to the enriching of some land, perhaps to a great quantity. "I am confident (says he), that there are in each county of England and Wales 2000 acres upon an average which might be thus treated, and every acre increased at least one pound in annual value. The general adoption therefore of watering is capable of being made a national advantage of more than 100,000l. per annum, besides the great improvement of other land arising from the produce of the meadows and the employment of the industrious poor. Such an improvement, one would think, is not unworthy of public notice; but if I had doubled the sum, I believe I should not have exceeded the truth, though I might have gone beyond the bounds of general credibility. In this one parish where I reside there are about 300 acres now watered; and it may be easily proved that the proprietors of the land reap from thence 1000l. yearly profit."

In Mr Boswell's treatise upon this subject, published in 1790, the author complains of the neglect of the practice of improving the wet, boggy, and rushy lands, which lie at the banks of rivers, and might be meliorated at a very small expence, when much larger sums are expended in the improvement of barren uplands and large tracts of heath in various parts of the kingdom: and he complains likewise of the little information that is to be had in books concerning the method of performing this operation. The only author from whom he acknowledges to have received any information is Blyth; and even his method of watering is very different from that practised in modern times; for which reason he proposes to furnish an original treatise upon the subject; and of this we shall now give the substance.

6
Land capable of being watered.

The first thing to be considered is, what lands are capable of being watered. These, according to Mr Boswell, are all such as lie low, near the banks of rivulets and springs, especially where the water-course is higher than the lands, and kept within its bounds by banks. If the rivulet has a quick descent, the im-

provement by watering will be very great, and the expences moderate. On level lands the water runs but slowly, which is also the case with large rivers; and therefore only a small quantity of ground can be overflowed by them in comparison of what can be done in other cases: but the water of large rivers is generally possessed of more fertilizing properties than that of rivulets. In many cases, however, the rivers are navigable, or have mills upon them; both of which are strong objections to the perfect improvement of lands adjacent to them. From these considerations, our author concludes, that the watering of lands may be performed in the best and least expensive manner by small rivulets and springs.

There are three kinds of soils commonly found near the banks of rivers and rivulets, the melioration of which may be attempted by watering. 1. A gravelly or sound warm firm soil, or a mixture of the two together. This receives an almost instantaneous improvement; and the faster the water runs over it the better. 2. Boggy, miry, and rushy soils, which are always found by the banks of rivers where the land is nearly level. These also are greatly improved by watering; perhaps equally so with those already described, if we compare the value of both in their unimproved state, this kind of ground being scarce worth any thing in its unimproved state. By proper watering, however, it may be made to produce large crops of hay, by which horned cattle may be kept through the winter and greatly forwarded; though, in its uncultivated state, it would scarce produce any thing to maintain stock in the winter, and very little even in summer. Much more skill, as well as expence, however, is requisite to bring this kind of land into culture than the former. 3. The soils most difficult to be improved are strong, wet, and clay soils; and this difficulty is occasioned both by their being commonly on a dead level, which will not admit of the water running over them; and by their tenacity, which will not admit of draining. Even when the utmost care is taken, unless a strong body of water is thrown over them, and that from a river the water of which has a very fertilizing property, little advantage will be gained; but wherever such advantages can be had in the winter, and a warm spring succeeds, these lands will produce very large crops of grass.

The advantage of using springs and rivulets for watering instead of large rivers is, that the expence of raising wares across them will not be great; nor are they liable to the other objections which attend the use of large rivers. When they run through a cultivated country also, the land floods occasioned by violent rains frequently bring with them such quantities of manure as contribute greatly to fertilize the lands, and which are totally lost where the practice of watering is not in use.

Springs may be useful to the coarse lands that lie near them, provided the water can be had in sufficient quantity to overflow the lands. "By springs (says our author), are not here meant such as rise out of poor heath or boggy lands (for the water issuing from them is generally so small in quantity, and always so very lean and hungry in quality, that little if any advantage can be derived from it); but rather the head of rivulets and brooks rising out of a chalky and gravelly

7
Springs and rivulets preferable to large rivers.

Meadow. gravelly sound firm soil, in a cultivated country. These are invaluable; and every possible advantage should be taken to improve the ground near them. The author knows a considerable tract of meadow-land under this predicament; and one meadow in particular that is watered by springs issuing immediately out of such a soil, without any advantage from great towns, &c. being situated but a small distance below the head of the rivulet, and the rivulet itself is fed all the way by springs rising out of its bed as clear as crystal. The soil of the meadow is a good loam some inches deep, upon a fine springy gravel. Whether it is from the heat of the springs, or whether the friction by the water running over the soil raises a certain degree of warmth favourable to vegetation, or from whatever cause it arises, the fecundity of this water is beyond conception; for when the meadow has been properly watered and well drained, in a warm spring, the grass has been frequently cut for hay within five weeks from the time the stock was taken out of it, having eat it bare to the earth: almost every year it is cut in six weeks, and the produce from one to three waggon loads to an acre. In land thus situated, in the mornings and evenings in the months of April, May, and June, the whole meadow will appear like a large furnace; so considerable is the steam or vapour which arises from the warmth of the springs acted upon by the sun-beams: and although the water is so exceeding clear, yet upon its being thrown over the land only a few days in warm weather, by dribbling through the grass, so thick a scum will arise and adhere to the blades of the grass, as will be equal to a considerable quantity of manure spread over the land, and (it may be presumed from the good effects) still more enriching.

"It is inconceivable what 24 hours water properly conveyed over the lands will do in such a season: a beautiful verdure will arise in a few days where a parched rusty soil could only be seen; and one acre will then be found to maintain more stock than ten could do before."

8
Explana-
tion of the
terms used
in water-
ing.

Mr Boswell next proceeds to an explanation of the terms used in this art; of the instruments necessary to perform it; and of the principles on which it is founded. The terms used are:

1. A **WARE**. This is an erection across a brook, rivulet, or river, frequently constructed of timber, but more commonly of bricks or stones and timber, with openings to let the water pass, from two to ten in number according to the breadth of the stream; the height being always equal to the depth of the stream compared with the adjacent land. The use of this is occasionally to stop the current, and to turn it aside into the adjacent lands.

2. A **SLUICE** is constructed in the same manner as a ware; only that it has but a single passage for the water, and is put across small streams for the same purposes as a ware.

3. A **TRUNK** is designed to answer the same purposes as a sluice; but being placed across such streams as either cattle or teams are to pass over, or where it is necessary to carry a small stream at right angles to a large one to water some lands lower down, is for these reasons made of timber, and is of a square figure.

The length and breadth are various as circumstances determine. **Meadow.**

4. A **CARRIAGE** is made of timber or of brick. If of timber, oak is the best; if of brick, an arch ought to be thrown over the stream that runs under it, and the sides bricked up: But when made of timber, which is the most common material, it is constructed with a bottom and sides as wide and high as the main in which it lies. It must be made very strong, close, and well-jointed. Its use is to convey the water in one main over another, which runs at right angles to it; the depth and breadth are the same with those of the main to which it belongs; and the length is determined by that which it crosses. The carriage is the most expensive instrument belonging to watering.

5. A **DRAIN-SLUICE**, or *Drain-Trunk*, is always placed in the lower part of some main, as near to the head as a drain can be found; that is, situated low enough to draw the main, &c. It is made of timber, of a square figure like a trunk, only much smaller. It is placed with its mouth at the bottom of the main, and let down into the bank; and from its other end a drain is cut to communicate with some trench drain that is nearest. The dimensions are various, and determined by circumstances. The use of it is, when the water is turned some other way, to convey the leaking water that oozes through the hatches, &c. into the drain, that otherwise would run down into the tails of those trenches which lie lowest, and there poach and rot the ground, and probably contribute not a little to the making it more unsound for sheep. This operation is of the utmost consequence in watering; for if the water be not thoroughly drained off the land, the soil is rotted; and when the hay comes to be removed, the wheels of the carriages sink, the horses are mired, and the whole load sometimes sticks fast for hours together. On the other hand, when the drain-trunks are properly placed, the ground becomes firm and dry, and the hay is speedily and easily removed.

7. **HATCHES** are best made of oak, elm, or deal; the use of them is to fit the openings of wares, trunks, or sluices; and to keep back the water when necessary, from passing one way, to turn it another. They ought to be made to fit as close as possible. When hatches belong to wares that are erected across large streams, or where the streams swell quickly with heavy rains, when the hatches are in their places to water the meadows; they are sometimes made so, that a foot or more of the upper part can be taken off, so that vent may be given to the superfluous water, and yet enough retained for the purpose of watering the meadows. In this case, they are called *flood-hatches*: but Mr Boswell entirely disapproves of this construction, and recommends them to be made entire, though they should be ever so heavy, and require the assistance of a lever to raise them up. For when the water is very high, and the hatches are suddenly drawn up, the water falls with great force upon the bed of the ware, and in time greatly injures it: but when the whole hatch is drawn up a little way, the water runs off at the bottom, and does no injury.

8. A **HEAD-MAIN**, is a ditch drawn from the river, rivulet, &c. to convey the water out of its usual current,

Meadow. current, to water the lands laid out for that purpose, by means of lesser mains and trenches. The head-main is made of various dimensions according to the quantity of land to be watered, the length or descent of it, &c. Smaller mains are frequently taken out of the head one; and the only difference is in point of size, the secondary mains being much smaller than the other. They are generally cut at right angles, or nearly so with the other, though not invariably. The use of the the mains, whether great or small, is to feed the trenches with water, which branch out into all parts of the meadow, and convey the water to float the land. By some, these smaller mains are improperly called *Carriages*.

9. A **TRENCH** is a small ditch made to convey the water out of the mains for the immediate purpose of watering the land. It ought always to be drawn in a straight line from angle to angle, with as few turnings as possible. It is never deep, but the width is in proportion to the length it runs, and the breadth of the plane between that and the trench-drain. The breadth tapers gradually to the lower end.

10. A **TRENCH-DRAIN** is always cut parallel to the trench, and as deep as the tail-drain water will admit, when necessary. It ought always, if possible, to be cut down to a stratum of sand, gravel, or clay. If into the latter, a spade's depth into it will be of great advantage. The use of it is to carry away the water immediately after it has run over the panes from the trench. It need not be drawn up to the head of the land by five, six, or more yards, according to the nature of the soil. Its form is directly the reverse of the trench; being narrower at the head, and growing gradually wider and wider until it empties itself into the tail-drain.

11. The **TAIL-DRAIN** is designed as a receptacle for all the water that flows out of the other drains, which are so situated that they cannot empty themselves into the river. It should run, therefore, nearly at right angles with the trenches, though generally it is thought most eligible to draw it in the lowest part of the ground, and to use it to convey the water out of the meadows at the place where there is the greatest descent; which is usually in one of the fence-ditches: and hence a fence-ditch is usually made use of instead of a tail-drain, and answers the double purpose of fencing a meadow and draining it at the same time.

12. A **PANE** of ground, is that part of the meadow which lies between the trench and the trench-drain; and in which the grass grows for hay. It is watered by the trenches, and drained by the trench-drains; whence there is a pane on each side of every trench.

13. A **WAY-PANE** is that part of the ground which lies in a properly watered meadow, on the side of the main where no trenches are taken out, but is watered the whole length of the main over its banks. A drain for carrying off the water from this pane runs parallel to the main. The use is to convey the hay out of the meadows, instead of the teams having to cross all the trenches.

14. A **BEND** is made in various parts of those trenches which have a quick descent, to obstruct the water. It is made, by leaving a narrow strip of green sward across the trench where the bend is intended to

be left; cutting occasionally a piece of the shape of a wedge out of the middle of it. The use is to check the water, and force it over the trench into the panes; which, were it not for these bends, would run rapidly on in the trench, and not flow over the land as it passes along. The great art in watering consists in giving to each part of the pane an equal proportion of water.

15. A **GUTTER** is a small groove cut out from the tails of these trenches where the panes run longer at one corner than the other. The use is to carry the water to the extreme point of the pane. Those panes which are intersected by the trench and tail-drains, meeting in an obtuse angle, require the assistance of gutters to convey the water to the longest side. They are likewise useful, when the land has not been so well levelled, but some parts of the panes lie higher than they ought: in which case, a gutter is drawn from the trench over that high ground, which otherwise would not be overflowed. Without this precaution, unless the flats be filled up (which ought always to be done when materials can be had to do it) the water will not rise upon it; and after the watering season is past, those places would appear rusty and brown, while the rest is covered with beautiful verdure. Our author, however, is of opinion, that this method of treating water-meadows ought never to be followed; but that every inequality in water-meadows should either be levelled or filled up. Hence the waterman's skill is shown in bringing the water over those places to which it could not naturally rise, and in carrying it off from those where it would naturally stagnate.

16. A **CATCH-DRAIN** is sometimes made use of when water is scarce. When a meadow is pretty long, and has a quick descent, and the water runs quickly down the drains, it is customary to stop one or more of them at a proper place, till the water flowing thither rises so high as to strike back either into the tail-drains so as to stagnate upon the sides of the panes, or till it flows over the banks of the drains and waters the grounds below, or upon each side. It is then to be conveyed over the land in such quantity as is thought proper, either by a small main, out of which trenches are to be cut with their proper drains, or by trenches taken properly out of it. In case of a stagnation, the design will not succeed; and it will then be necessary to cut a passage to let the stagnating water run off. Even when the method succeeds best, Mr Boswell is of opinion, that it is not by any means eligible; the water having been so lately strained over the ground, that it is supposed by the water-men not to be endowed with such fertilizing qualities as at first; whence nothing but absolute necessity can justify the practice.

17. A **POND** is any quantity of water stagnating upon the ground, or in the tail-drain, trench-drains, &c. so as to annoy the ground near them. It is occasioned sometimes by the flats not having been properly filled up; at others, when the ware not being close shut, in order to water some grounds higher up, the water is thereby thrown back upon the ground adjacent.

18. A **TURN** of water signifies as much ground as can be watered at once. It is done by shutting down the

Meadow.

Meadow. the hatches in all those wares where the water is intended to be kept out, and opening those that are to let the water through them. The quantity of land to be watered at once must vary according to circumstances; but Mr Boswell lays down one general rule in this case, viz. that no more land ought to be kept under water at one time than the stream can supply regularly with a sufficient quantity of water; and if this can be procured, water as much ground as possible.

19. The **HEAD** of the meadow, is that part of it into which the river, main, &c. first enter.

20. The **TAIL** is that part out of which the river, &c. last passes.

21. The **UPPER SIDE** of a main or trench, is that side which (when the main or trench is drawn at right angles, or nearly so, with the river) fronts the part where the river entered. The lower side is the opposite.

22. The **UPPER PANE** in a meadow, is that which lies on the upper side of the main or trench that is drawn at right angles with the river: where the river runs north and south, it enters in the former direction, and runs out in the southern, the main and trenches running east and west. Then all those panes which lie on the north side of the mains are called *upper panes*; and those on the south side the *lower panes*. But when the mains, trenches, &c. run parallel to the river, there is no distinction of panes into upper and lower.

The instruments used in watering meadows are:

1. A *Water-Level*. The use of this is to take the level of the land at a distance, and compare it with that of the river, in order to know whether the ground can be overflowed by it or not. This instrument, however, is useful only in large undertakings; for such as are on a smaller scale, the workmen dispense with it in the following manner: In drawing a main, they begin at the head, and work deep enough to have the water follow them. In drawing a tail-drain, they begin at the lower end of it and work upwards, to let the tail-water come after them. By this method we obtain the most exact level.

2. The *Line, Reel, and Breast-Plough*, are absolutely necessary. The line ought to be larger and stronger than that used by gardeners.

3. *Spades*. Those used in watering-meadows are made of a particular form, on purpose for the work; having a stem considerably more crooked than those of any other kind. The bit is iron, about a foot wide in the middle, and terminating in a point: a thick ridge runs perpendicularly down the middle, from the stem almost to the point. The edges on both sides are drawn very thin, and being frequently ground and whetted, the whole soon becomes narrow; after which the spades are used for trenches and drains; new ones being procured for other purposes. The stems being made crooked, the workmen standing in the trench or drain are enabled to make the bottoms quite smooth and even.

4. *Wheel and Hand barrows*. The former are used for removing the clods to the flat places, and are quite open, without any sides or hinder part. The latter are of service where the ground is too soft to admit the use of wheel-barrows, and when clods are to be re-

N^o 198.

moved during the time that the meadow is under **Meadow.** water.

5. *Three-wheeled carts* are necessary when large quantities of earth are to be removed; particularly when they are to be carried to some distance.

6. Short and narrow *Scythes* are made use of to mow the weeds and grass, when the water is running in the trenches, drains, and mains.

7. *Forks*, and long *Crooks* with four or five tines, are used for pulling out the roots of sedge, rushes, reeds, &c. which grow in the large mains and drains. The crooks should be made light, and have long stems to reach wherever the water is so deep that the workmen cannot work in it.

8. Strong *Water-boots*, the tops of which will draw up half the length of the thigh, are indispensably necessary. They must also be large enough to admit a quantity of hay to be stuffed down all round the legs, and be kept well tallowed to resist the running water for many hours together.

The principles on which the practice of watering meadows depend are few and easy.

1. Water will always rise to the level of the receptacle out of which it is originally brought.

2. There is in all streams a descent greater or smaller; the quantity of which is in some measure shown by the running of the stream itself. If it runs smooth and slow, the descent is small; but if rapidly and with noise, the descent is considerable.

3. Hence if a main be taken out of the river high enough up the stream, water may be brought from that river to flow over the land by the side of the river, to a certain distance below the head of the main, although the river from whence it is taken should, opposite to that very place, be greatly under it.

4. Water, sunk under a carriage which conveys another stream at right angles over it, one, two, or more feet below its own bed, will, when it has passed the carriage, rise again to the level it had before.

5. Water conveyed upon any land, and there left stagnant for any length of time, does it an injury; destroying the good herbage, and filling the place with rushes, flags, and other weeds.

6. Hence it is absolutely necessary, before the work is undertaken, to be certain that the water can be thoroughly drained off.

In Mr Wright's treatise upon this subject, the author considers a solution of the three following questions as a necessary preliminary to the operation of watering. 1. Whether the stream of water will admit of a temporary dam or ware across it? 2. Can the farmer raise the water by this means a few inches above its level, without injuring his neighbour's land? 3. Can the water be drawn off from the meadow as quick as it is brought on?—If a satisfactory answer can be given to all these questions, he directs to proceed in the following manner.

Having taken the level of the ground, and compared it with the river, as directed by Mr Boswell, cut a deep wide ditch as near the dam as possible, and by it convey the water directly to the highest part of the meadow; keeping the sides or banks of the ditch of an equal height, and about three inches higher than the general surface of the meadow. Where the meadow

9
Principles
on which
the practice of wa-
tering de-
pends.

10
Wright's
method.

Meadow. **dow** is large, and has an uneven surface, it will sometimes be necessary to have three works in different directions, each five feet wide, if the meadow contains 15 acres, and if the highest part be farthest from the stream. A ditch of 10 feet wide and three deep will commonly water 10 acres of land. When there are three works in a meadow, and flood-hatches at the mouth of each, when the water is not sufficient to cover the whole completely at once, it may be watered at three different times, by taking out one of the hatches, and keeping the other two in. In this case, when the water has run over one division of the land for 10 days, it may then be taken off that and tumbled over to another, by taking up another hatch and letting down the former; by which means the three divisions will have a proper share of the water alternately, and each reap equal benefit. The bottom of the first work ought to be as deep as the bottom of the river, when the fall in the meadow will admit of it; for the deeper the water is drawn, the more mud it carries along with it. From the works, cut, at right angles, smaller ditches or troughs, having a breadth proportioned to the distance to which some part of the water is to be carried, their distance from each other being about 12 yards. A trough two feet wide and one foot deep, will water a surface 12 yards wide and 40 feet long. In each trough as well as ditch place frequent stops and obstructions, especially when the water is rapid, to keep it high enough to flow through the notches or over the sides. Each ditch and trough is gradually contracted in width, as the quantity of water constantly decreases the farther they proceed. Between every two troughs, and at an equal distance from both, cut a drain as deep as you please parallel to them, and wide enough to receive all the water that runs over the adjacent lands, and to carry it off into the master-drain with such rapidity as to keep the whole sheet of water in constant motion; and if possible, not to suffer a drop to stagnate upon the whole meadow. "For a stagnation, says he, (though it is recommended by a Mr D. Young for the improvement of arable land), is what we never admit in our system of watering; for we find that it rots the turf, soaks and starves the land, and produces nothing but coarse grass and aquatic weeds.

Meadow. "When a meadow lies cold, flat, and swampy, the width of the bed, or the distance between the trough and drain, ought to be very small, never exceeding six yards: indeed, in this case, you can scarcely cut your land too much, provided the water be plentiful; for the more you cut, the more water you require. The fall of the bed in every meadow should be half an inch in a foot: less will do, but more is desirable; for when the draught is quick, the herbage is always fine and sweet. The water ought never to flow more than two inches deep, nor less than one inch, except in the warm months."

Mr Wright proceeds now to answer some objections made by the Reviewers in their account of the first edition of his work. 1. That the Gloucestershire farmers use more water for their lands than is necessary. To this it is answered, That where water is plentiful, they find it advantageous to use even more water than he recommends; and when water is scarce, they choose rather to water only one half, or even a smaller portion of a meadow at a time, and to give that a plentiful covering, than to give a scanty one to the whole. 2. The Reviewers likewise recommend a repeated use of the same water upon different and lower parts of the same meadow, or to make each drain serve as a trough to the bed which is below it. But tho' this method is in some degree recommended by the celebrated Mr Bakewell, and taught by a systematic waterer in Staffordshire, he entirely disapproves of it; excepting where the great declivity of the land will not admit of any other plan. "This cannot (says he) be a proper mode of watering grass-land in the winter-time; for it can be of no service to the lowest parts of the meadow, unless as a wetting in spring or summer. The first or highest part of a meadow laid out according to this plan will indeed be much improved; the second may reap some benefit; but the third, which receives the exhausted thin cold water, will produce a very unprofitable crop. Our farmers never choose more than a second use in the same meadow, and that very seldom; they call even the second running by the significant name of *small-beer*; which, they say, may possibly satisfy thirst, but can give very little life or strength to land (A). It is a much better method to have a meadow laid out so as to be watered at several

11
Objections
to his method answered.

12
A repeated
use of the
same water
is not eligible.

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veral

(A) As by the concurrence of Mr Boswell with this author, and likewise by the agreement of so many practical farmers, it seems established as a fact, that water does really lose its fertilizing properties by running over grass, it may not here be amiss to explain the principle on which it does so.

Under the article AGRICULTURE, we have shown at some length, that the true food of plants is the parts of animal and vegetable substances dissolved and volatilized by putrefaction, in such a manner that they can be absorbed by the vessels of other plants, and thus become part of their substance. There are two ways in which these effluvia may be dissolved, viz. in air and in water; of consequence, air and water are the two media by which the food of plants is applied to them, and by means of which they are augmented in bulk. From the analysis of these two elements, it is known that both of them, at least in their ordinary state, contain a great quantity of volatilized earthy matter, which sometimes strikes our senses very forcibly when first emitted by putrefying bodies; but on being thoroughly dissolved by the atmosphere, it totally eludes them, and becomes the PHLOGISTON concerning which such violent disputes have arisen. This fine volatilized matter is absorbed from the atmosphere by the leaves of the plants, and from the water by their roots. Hence both elements, when loaded with vapours of this kind, are more favourable to vegetation than when in their pure state. Thus plants will thrive very well in putrid air, while they languish and die in the pure dephlogisticated kind. Just so it is with the element of water. When this is loaded with a great quantity of putrid matter, it readily parts with it not only to the roots of plants, but to the atmosphere also; whence such vegetables as it

has

Meadow. veral times, and to be at the expence of several small flood-hatches, than to water the whole of it at once by means of catch-drains.

" Sometimes it is necessary, in a large meadow, to convey the water that has been used under the works and troughs; and then the water above is supported by means of boards and planks, which we call a *carry-bridge*. Sometimes, the better to regulate the course of the water on the surface, especially in the spring, narrow trenches are dug, and the mould laid by the side of them, in order to be restored to its former place when the watering is finished. The earth and mud thrown out in cleansing and paring the ditches should be carried to fill up the low hollow parts of the meadow, and be trodden down with an even surface; which will easily be done when the water is on, the waterman being always provided with a strong pair of water-proof boots. If the mould thus used has upon it a turf that is tolerably fine, place it uppermost; but if it is sedgey and coarse, turn it under, and the water if it runs quick will soon produce a fine herbage upon it.

" The grounds that are watered in the easiest and most effectual manner, are such as have been ploughed and ridged up in lands about twelve yards wide. Here the water is easily carried along the ridge by means of a small ditch or trough cut along its summit, and then, by means of the stops in it, is made to run down the sides or beds into the furrows, by which it is carried into the master drain, which empties itself into the river. Every meadow, before it is well watered, must be brought into a form something like a field that has been thus left by the plough in a ridged state. Each side of the ridge should be as nearly as possible an exact inclined plane, that the water may flow over it as equally as may be." Mr Wright does not, like Mr. Boswell, disapprove of the use of flood-hatches; he only gives the following hint, viz. that their basis should be deep and firmly fixed, well secured with stone and clay, that it be not blown up. The following directions are given for each month of watering:

13
Of cleaning
and repair-
ing the
works.

14
Thick and
muddy wa-
ter to be u-
sed when it
can be
done.

In the beginning of November, all the ditches, troughs, and drains, are to be thoroughly cleansed by the spade and breast-plough, from weeds, grass, and mud; and well repaired, if they have received any injury from cattle. After a shower, when the water is thick and muddy, turn over the meadow as much water as you can without injuring the banks of the works, especially if the land be poor; as in this month, according to our author, the water contains many more fertilizing particles, which he calls *salts* and *richness*, than later in the winter. In defence of this position, of which it seems the Monthly Reviewers have doubted, our author urges, that though he is not able to prove it by any chemical analysis, yet it seems evident,

Meadow. that " after the first washing of farm yards, various sinks, ditches, and the surface of all the adjoining fields, which have lain dry for some time, the common stream should then contain much more fatness than when the same premises have been repeatedly washed." This is confirmed by the experience of the Gloucestershire farmers; who, if they can at this season of the year procure plenty of muddy water to overflow their grounds for one week, look upon it to be equally valuable with what is procured during all the rest of the winter. In support of this, he quotes the following words of Mr Forbes, in a treatise on watering: " The water should be let in upon the meadow in November, when the first great rains make it muddy, for then it is full of a rich sediment, brought down from the lands of the country through which it runs, and is washed into it by the rain; and as the sediment brought by the first floods is the richest, the carriages and drains of the meadow should all be scoured clean and in order, before these floods come."

" In opposition (adds Mr Wright) to the opinion of practical waterers, that the muddiness of the water is of little consequence, I hesitate not to affirm, that the mud is of as much consequence in winter-watering, as dung is in the improvement of a poor upland field. For each meadow in this neighbourhood is fruitful in proportion to the quantity of mud that it collects from the water. And, indeed, what can be conceived more enriching than the abundant particles of putrid matter which float in the water, and are distributed over the surface of the land, and applied home to the roots of the grass. It is true, that any the most simple water thrown over a meadow in proper quantity, and not suffered to stagnate, will shelter it in winter, and in the warmth of spring will force a crop; but this unusual force must exhaust the strength of the land, which will require an annual supply of manure in substance, or, in a course of years, the soil will be impaired rather than improved. The meadows in this county, which lie next below a market-town or village, are invariably the best; and those which receive the water after it has been two or three times used, reap proportionably less benefit from it: For every meadow that is well laid out, and has any quantity of grass upon its surface, will act as a fine sieve upon the water, which, though it flow in ever so muddy, will be returned back to the stream as clear as it came from the fountain. This circumstance, when there is a range of meadows to be watered, the property of different persons, when water is scarce, creates vehement contentions and struggles for the first use of it. The proprietors are therefore compelled to agree among themselves, either to have the first use alternately, or for the higher meadows to dam up, and use only one half or a less portion of the river. Our farmers know

has access to, arrive at the utmost luxuriance of growth. If the water is more pure, still they will thrive very well; but the luxuriance of vegetation is less than in the former case. At last, however, when the water has parted with a certain quantity of phlogistic matter, the process of vegetation is incapable of separating any more; and therefore such water, though applied to the roots of vegetables, cannot communicate to them any remarkable increase. Nay, it is by no means improbable, that after water has arrived at this state, it will, instead of giving any fresh nourishment to the plants, again deprive them of the nourishment which they have already received; and this is probably what Mr Boswell means, when, in the passage formerly quoted, he calls the water *hungry*.

Meadow. know the mud to be of so much consequence in watering, that whenever they find it collected at the bottom of the river or the ditches, they hire men whole days to disturb and raise it with rakes made for the purpose, that it may be carried down by the water, and spread upon their meadows. One meadow in South Cerney, I think, is an incontestible proof of the consequence of muddy water. It is watered by a branch of the common stream that runs for about half a mile down a public road. This water, by the mud on the road being continually disturbed by carriages and the feet of cattle, becomes very thick, and when it enters the meadow is almost as white as milk. This field, which consists of seven acres, was a few years ago let for 10 s. an acre, but is already become the richest land in the parish, and has produced at one crop eighteen loads of hay, and each load more than 25 hundred weight."

15
Instance of
the good
effects of
muddy wa-
ter.

16
Mr Wim-
pey's opi-
nion upon
the sub-
ject.

In further confirmation of what our author asserts, he quotes, from the Annals of Agriculture, the following words of Mr Wimpey: "As to the sorts of water, little is to be found, I believe, which does not encourage and promote vegetation, even the most simple, elementary, and uncompounded fluid: heat and moisture, as well as air, are the *sine qua non* of vegetation as well as animal life. Different plants require different proportions of each to live and flourish; but some of each is absolutely necessary to all. However, experience as well as reason universally shows, that the more turbid, feculent, and replete with putrescent matter the water is, the more rich and fertilizing it proves. Hasty and impetuous rains, of continuance sufficient to produce a flood, not only dissolve the salts, but wash the manure in substance off the circumjacent land into the rapid current. Such turbid water is both meat and drink to the land; and, by the unctuous sediment and mud it deposits, the soil is amazingly improved and enriched. The virtue of water from a spring, if at all superior to pure elementary water, is derived from the several strata or beds of earth it passes through, that, according to the nature of such strata, it may be friendly or otherwise to vegetation. If it passes through chalk, marle, fossil shells, or any thing of a calcareous nature, it would in most soils promote the growth of plants; but if through metallic ores, or earth impregnated with the vitriolic acid, it would render the land unfertile, if not wholly barren. In general the water that has run far is superior to that which immediately flows from the spring, and more especially that which is feculent and muddy, consisting chiefly of putrid animal substances washed down the stream."

17
Confirmed
by Mr For-
bes.

To the same purpose also says Mr Forbes: "There is great difference in the quality of water, arising from the particles of different kinds of matter mixed with them. Those rivers that have a long course through good land are full of fine particles, that are highly fertilizing to such meadows as are usually overflowed by them; and this chiefly in floods, when the water is fullest of a rich sediment: for when the water is clear, though it may be raised by art high enough to overflow the adjoining lands, and be of some service to them, the improvement thus made is far short of what is obtained from the same water when it is thick and muddy."

Mr Boswell, though quoted by Mr Wright as an advocate for the doctrine just now laid down, seems, in one part of his work at least, to be of a contrary opinion. This is in the 14th chapter of his book, where he remarks upon another publication on the same subject, the name of which he does not mention: "In page 4th of that pamphlet (says Mr Boswell), the writer informs us, 'if the water used be always pure and simple, the effect will by no means be equal to the above; that is, of a stream that is sometimes thick and muddy. We have a striking instance of this in two of our meadows, which are watered immediately from springs that arise in the grounds themselves. Their crops are early and plentiful, but not of a good quality, and the land remains unimproved after many years watering.'

18
Mr Bos-
well's opi-
nion.

"The writer of this treatise (Mr Boswell), in a former edition, had asserted, and in this repeated, the contrary effects from a stream very near the spring-head, as clear as crystal.

"The gentleman (Mr Beverly of Keld) whom that writer mentions in his preface, made a short visit last spring into Dorsetshire, to satisfy himself of the fact. The editor had the pleasure to show him the stream alluded to, which he traced almost to the fountain-head. It was perfectly clear, and the water was then immediately conveyed out of the stream upon the lands adjoining, some of which it was then running over; others it had been upon, and the verdure was then appearing. The gentleman expressed himself perfectly satisfied with the fact. To him the editor wishes to refer, &c. Mr George Culley of Fenton near Wooller in Northumberland, with a truly noble and public spirit that does him great honour as a friend to his country, sent a very sensible young man from thence into Dorsetshire, to learn the art of watering meadows, and to work the whole season in those meadows under different watermen. This man was often over those meadows, and worked in some just below that were watered by the same stream. Might the editor presume to offer his opinion upon this seeming contradiction, it is very probable that the soils, both the upper and under strata, are very different, as well as those through which the different springs run."

From this passage, the latter part of which is not very intelligible, we might conclude that Mr Boswell prefers clear to muddy water for overflowing meadows. In his chapter on land-floods, however, he expresses himself as follows: "They will (says he) always be found of great use where the sweepings of towns, farm-yards, &c. are carried down by them; seldom any other erection is wanting besides a sluice or small ware to divert and convey them over the lands. If the situation of the land happens to be on the side of a hill, catch-drains are absolutely necessary for watering the lower part of the hill, after the water has been used upon the upper. In many parts of the kingdom, where there are large hills or extensive rising lands, great quantities of water run from them into the valleys after heavy rains: These might with proper attention be collected together before they get to the bottom or flat ground, and from thence be diverted to the purpose of watering those lands that lie below, with great advantage to the occupier, and at

19
Advantages
of land-
floods.

Meadow.
20
Of convert-
ing arable
land into
pasture.

a small expence. And should the land thus situated be arable, yet it would be found a beneficial exchange to convert it into pasture; particularly if pasturing-ground should be a desirable object to the occupier. The method of performing it is thus recommended. Observe the piece of land or field best adapted to the purpose, both for situation and soil. If it should be arable, make it first very level; and with the crop of corn sow all sorts of hay seeds; and as soon as it has got a green sward it may be laid out. In the lowest part of the ground draw a deep ditch for the current to run in through it; and continue it into some ditch or low part in the lands below, that the water may be freely carried off, after it has been and while it is in use. Draw ditches above the field intended to be watered assant the sides of the hill, in such a manner that they may all empty themselves into the head of the ditch above-mentioned, just where it enters the field to be watered: then erecting a ware across this ditch, the field will be capable of being watered, according to the situation of the ditch in the middle or on the side of the field. It must then be conveyed by small mains or trenches, and subdivided again by branch-trenches, according to the site of the field and the quantity of water that can be collected; trench-drains must be drawn, and the water conveyed into the ditch by means of tail-drains. A person unacquainted with water-meadows cannot conceive the advantage arising from water thus collected and conveyed over this species of water-meadow (if it may be so called), being generally a firm good soil; for the water running down from rich cultivated hills, eminences, &c. sweeps away with it, when the rain falls very heavy, vast quantities of dung dropped by sheep and other cattle, and the manure carried upon arable lands; all which being now diverted, and carried over the meadow with an easy descent, gives time for the particles of manure to subside upon the ground at one season, or of being filtered from it as it dribbles through the grafs at another; after which the warm weather pushes on vegetation amazingly. Meadows thus situated would be vastly superior to any other, if they had the advantage of a constant stream; but even as they are, taking the opportunity of watering them by every heavy rain or flood that happens, they will be found to be very valuable. The occupier of such lands is strenuously advised to let no time be lost in appropriating them to this use; because these lands are healthy for all kinds of cattle at almost all seasons; and the expence of converting them into this kind of water-meadow is exceeding small, the annual charges afterwards quite trifling, and the produce very considerable."

21
Mr Wright's
directions
for water-
ing through
the differ-
ent months
of the year.

Mr Wright, having discussed the subject of the quality of the water, proceeds to give directions for watering through the different months of the year:—"In December and January, the chief care consists in keeping the land sheltered by the water from the severity of frosty nights. It is necessary, however, through the whole winter, every ten days or fortnight to give the land air, by taking the water off entirely; otherwise it would rot and destroy the roots of the grafs. It is necessary, likewise, that a proper person should go over every meadow at least twice every week, to see that the water is equally distributed, and to re-

move all obstructions arising from the continual influx of weeds, leaves, sticks, and the like. In February, a great deal depends upon care and caution. If you now suffer the water to remain on the meadow for many days without intermission, a white scum is raised, very destructive to the grafs; and if you take off the water, and expose the land to a severe frosty night, without its being previously dried for a whole day, the greatest part of the tender grafs will be cut off. The only ways to avoid both these injuries are, either to take the water off by day to prevent the scum, and to turn it over again at night to guard against the frost; or, if this practice be too troublesome, both may be prevented by taking the water entirely off for a few days and nights, provided the first day of taking off be a dry one; for if the grafs experience one fine drying day, the frost at night can do little or no injury. The scum is generated chiefly by the warmth of the sun, when the water is thin and used too plentifully. Towards the middle of this month we vary our practice in watering, by using only about half the quantity of water which is made use of earlier in the winter, all that is now required being to keep the ground in a warm moist state, and to force vegetation.

"At the beginning of March, the crop of grafs in the meadows is generally sufficient to afford an abundant pasturage for all kinds of stock, and the water is taken off for near a week, that the land may become dry and firm before the heavy cattle are turned in.—It is proper, the first week of eating off the spring-feed, if the season be cold, to give the cattle a little hay each night."

"It is a custom (says Mr Wright) with some farmers in Hampshire, to eat off the spring-grafts of their meadows with ewes and lambs, in the same manner that we do a field of turnips, by inclosing a certain portion each day with hurdles or stakes, and giving them hay at the same time. This is certainly making the most of the grafs, and an excellent method to fine and sweeten the future herbage. In this month and April, you may eat the grafs as short and close as you please, but never later; for if you trespass only one week on the month of May, the hay-crop will be very much impaired, the grafs will become soft and woolly, and have more the appearance and quality of an after-math than a crop. At the beginning of May, or when the spring feeding is finished, the water is again used for a few days by way of wetting.

"It is rather remarkable, that watering in autumn, winter, or spring, will not produce that kind of herbage which is the cause of the rot in sheep; but has been known to remove the cause from meadows, which before had that baneful effect. If, however, you use the water only a few days in any of the summer months, all the lands thus watered will be rendered unsafe for the pasturage of sheep. Of this I was lately convinced from an experiment made by a friend. At the beginning of July, when the hay was carried off, and the water rendered extremely muddy and abundant by several days rain, he thought proper to throw it over his meadows for ten days, in which time a large collection of extremely rich manure was made upon the land. In about a month the meadow was covered with uncommon luxuriance and blackness of herbage. Into this grafs were turned eight

Meadow.

22
Of eating
off the
spring grafs
with ewes
and lambs.

23
How wa-
tering may
occasion
the rot in
sheep.

Meadow. eight found ewes and two lambs. In six weeks time the lambs were killed, and discovered strong symptoms of rottenness; and in about a month afterwards one of the ewes was killed, and though it proved very fat, the liver was putrid and replete with the insect called the *fluke* or *weevil*: the other ewes were sold to a butcher, and all proved unsound. This experiment, however, convinces me, by the very extraordinary improvement made thereby in the meadow, that muddy water in the summer is much more enriching than it is in autumn or winter; and ought, therefore, to be used for a week at least every wet summer, notwithstanding its inconveniences to sheep, the most profitable species of stock."

24
Mr Boswell's general directions for watering.

Mr Boswell, besides his general directions for watering, gives many plans of the ditches, drains, &c. for particular meadows, some of them done from an actual survey. But these being confined to particular situations, we shall here only speak of his method in general. In his third chapter, intitled *A general Description of Water-meadows*, he observes, that "lands capable of being watered, lie sometimes only on one side and sometimes on both sides of the stream designed to supply them with water. In the former case, when they have a pretty quick descent, the land may be often watered by a main drawn out of the stream itself, without any ware; though he acknowledges that it is by far the best way to erect a ware, and to draw mains on each side, to dispose of the water to the best advantage.

Boggy lands require more and longer continued watering than such as are sandy or gravelly; and the larger the body of water that can be brought upon them, the better. The weight and strength of the water will greatly assist in compressing the soil, and destroying the roots of the weeds that grow upon it; nor can the water be kept too long upon it, particularly in the winter season; and the closer it is fed, the better.

To improve strong clay soils, we must endeavour to the utmost to procure the greatest possible descent from the trench to the trench drain; which is best done by making the trench-drains as deep as possible, and applying the materials drawn out of them to raise the trenches. Then, with a strong body of water, taking the advantage of the autumnal floods, and keeping the water some time upon them at that season, and as often as convenient during the winter, the greatest improvement on this sort of soils may be made. Warm sand or gravelly soils are the most profitable under the watering system, provided the water can be brought over them at pleasure. In soils of this kind, the water must not be kept long at a time, but often shifted, thoroughly drained, and the land frequently refreshed with it: under which circumstances the profit is immense. A spring-feeding, a crop of hay, and two aftermaths, may be obtained in a year; and this, probably, where in a dry summer scarce grass enough could be found to keep a sheep alive. If the stream be large, almost any quantity of land may be watered from it; and though the expence of a ware over it is great, it will soon be repaid by the additional crop. If the stream is small, the expence will be so in proportion.

The following method of improving a water-mea-

dow that was springy has been tried by Mr Boswell with success. The meadow had been many years watered by a spring rising just above it from a barren sandy heath; the soil near the surface was in some places a gravelly sand, in others a spongy cork, both upon a strong clay and sand mixture, which retained the draining of the lands above it. Whenever it had been watered, and left to drain itself dry, a yellowish-red water stood in many parts, and oozed out of others; the herbage being no other than a poor, miserable, hairy grass and small sedge. Chalk and ashes had been thrown over it to very little purpose. It was then drained underground asslant all the different descents, and all these drains carried into one large drain, which had been already cut for the purpose of carrying off the water when the meadow was overflowed. These drains were cut quite through the mixture of clay and sand, and as much deeper as the fall of the ground below would admit of; then, with chalk cut for the purpose, small hollow drains were formed at the bottom of these; the drains were then filled up with the materials that came out.

This was done in the beginning of summer, and the work frequently examined through the season; the soil was found firmer than before, and none of that nasty red water to be met with upon the surface, though it continually oozed into the drains. In autumn the meadow was again prepared for waterings, by repairing those trenches and drains that were properly situated; cutting others where wanted, for the purpose of watering meadows. The water being then brought over it from the same spring as before, the event answered the most sanguine wishes of the proprietor; the effects were visible the first year, and the ground has been constantly improving ever since.

Mr Boswell also informs us, that a gentleman in Scotland had applied to him for directions to water some lands lying on the sides of hills, where the descent is quick; and of which there are many in this country, as well as in the north of England. It would be difficult to water such lands by means of drains and trenches according to the directions already given; because the bends in the trenches must be very near together and large, as the water must flow out of the trench above the bend to flow over the pane below it; the number and size would likewise be inconvenient, and greatly offend the eye.

Lands of this sort are generally capable of being ploughed; in which case our author directs them to be once ploughed in the spring, and sown with oats or any other kind of grain that will rot the sward. When the grain is harvested, plough the land across; the last ploughing with the Kentish plough, which has a moveable mold-board, and is called a *turn-wrist* plough. This turns the furrows down the side of the hill, the horses going forwards and backwards in the same furrows. By this means the land is laid flat without any open furrows in it: dress it down in the spring very fine, and sow it with oats, and mix with some kinds of grass seeds very thick. Thus the ground will have but few irregularities; and as soon as the corn is carried off, or the following spring at farthest, the mains and drains may be cut out.

For watering coarse lands that are firm enough to bear

Meadow.
25
Method of improving a springy water-meadow.

26
Of watering lands on the sides of hills.

Meadow. bear the plough, and situated near a stream, our author gives the following directions.

27
Of watering coarse lands.

"Let the land thus situated be ploughed once in the spring, and sown with any grain that will rot sward. As soon as the crop is off, plough it again, and leave it rough through the winter. Work it down early in the spring, and plough it in the direction the trenches are to lie, making the ridges of a proper size for watering, ten or twelve yards wide for instance; work it fine; then gather the ridges up again in the same manner, making the last furrows of each ridge as deep as possible. If the land be not fine, dress it down again, and gather it up a second time if necessary; and with a shovel throw the earth from the edges of the furrows to the tops of the ridges, to give the greatest possible descent from the trench to the drain. Sow it with oats and grass seeds very thick; and after the corn is carried off, the trenches may be formed upon the top of each ridge, dispersing the furrows with a spade as much as the fall of the land will admit of for the drains; taking care to procure sufficient fall at all events, to drain the lands after they have been watered. By this method the crops of corn will nearly pay all the expence, and the land will be in excellent order.

28
Of the management of meadows after watering.

After the work of watering a meadow is totally finished, and the hay carried off, cattle may be let in to eat the after-math. When this is done, it will then be necessary to examine whether or not the mains have suffered any injury from their feet; whether there be quantities of mud or sand collected at the angles, &c. all of which must be thrown out and the breaches repaired; by which means the trenches, drains, &c. will last three years, but otherwise not more than two. The roots, mud, &c. may be used in repairing the breaches, but never left upon the sides of the trenches out of which they are taken. The tail-drains require to be cleansed oftener than any of the other works, for this obvious reason, that the mud, &c. is carried down from all the others into them; where if it be allowed to accumulate, it occasions a stagnation of water upon the meadow itself. In repairing the trenches, particular care ought to be taken that the workmen do not make them any wider than before, which they are very apt to do; neither are they to be allowed to throw the materials which they dig out in a ridge behind the edge of the trench, which both widens it and promotes weeds.

29
Of the times the water should continue upon the meadows.

During the time of watering, it will be necessary to examine the meadow every two or three days in order to remove obstructions, &c. If the drains should be filled with water and run over, they ought to be made deeper; or if this cannot be done, they should be widened. In the winter time a regular strong water should be kept, avoiding very strong great floods. In this season the water may be kept on the ground with safety for a month or even six weeks if the soil be corky or boggy or a strong clay; but not quite so long if it be gravel or sand. At the second watering a fortnight or three weeks will be sufficient; and after Candlemas a fortnight will be rather too long. At the third watering a week will be sufficient, which will bring it to about the middle of March; by which time, if the weather be tolerably mild, the grass will be long enough for the ewes and lambs, or fattening

lambs; which may then be turned into the meadow with great advantage. Even in the end of February, if the winter has been very mild, the grass will be long enough for them. Here they may be permitted to feed till the beginning of May, changing them into different meadows. As soon as they are taken out, the water must be turned in for a week, carefully examining every trench and drain for the reasons already given. The water is then to be shifted into others, alternately watering and draining, lessening the time the water remains upon it as the weather grows warmer; and in five, six, or seven weeks, the grass will be fit to be mown for hay, and produce from one to two tons, or even more, an acre upon good ground.

Mr Boswell directs, that about a week before the grass is to be mown the water should be let into the meadow for 24 hours; which, he says, will make the ground moist at the bottom, the scythe will go thro' it the more easily, and the grass will be mown closer to the ground. This practice, however, is entirely disapproved of by Mr Wright. "Though it may prevail in Dorsetshire (says he), it is very seldom advisable, for the following reasons: Water made to run through a thick crop of grass, though it may appear ever so pure, will leave a certain quantity of adherent scum or sediment, which can never be separated from the hay, but will render it unpalatable, if not prejudicial, to the cattle that eat it. And this wetting of the land and grass will impede the drying or making of the hay perhaps some days, which in difficult seasons is of very great consequence; and it will likewise make the turf too soft and tender to support the wheels of a loaded waggon in carrying off the hay. Besides, there is reason to believe that one day's wetting in the summer will, upon most meadows, endanger the soundness of every sheep that feeds upon the after-math."

The spring-feeding ought never to be done by heavier cattle than sheep or calves; for larger cattle do much hurt by poaching the ground with their feet, destroying the trenches, and spoiling the grass. Mr Boswell likewise greatly recommends a proper use of spring floods, from which he says much benefit may be derived; but if there is any quantity of grass in the meadows not eaten, these floods must be kept out, otherwise the grass will be spoiled; for they bring with them such quantities of sand and mud, which stick to the grass, that the cattle will rather starve than taste it. Great quantities of cgrass or aftermath are frequently spoiled in flat countries by the floods which take place in the fall. In the winter-time, however, when the ground is bare, the sand and mud brought down by the floods is soon incorporated with the soil, and becomes an excellent manure. The certain rule with regard to this matter is, "Make use of the floods when the grass cannot be used; avoid them when the grass is long or soon to be cut."

"It has often been a subject of dispute (says Mr Boswell), whether, from the latter end of autumn to Candlemas, the throwing a very strong body of water, where it can be done, over the meadows, is of any essential service or not? Those who consider it as advantageous, assert, that when the waters run rude and strong over the ground, they beat down and rot the tufts

Meadow.

30
Of spring feeding.

31
Of watering from the end of autumn to Candlemas.

Meadow.

tufts of foggy or rough grafs, fedge, &c. that are always to be found in many parts of coarfe meadow-ground; and therefore are of peculiar fervice to them. On the other fide it is alleged, that by coming in fo large a body, it beats the ground (in the weak places particularly) fo bare, that the fward is destroyed; and alfo brings with it fuch quantities of feeds of weeds, that at the next hay feafon the land in all thofe bare places bears a large burden of weeds, but little grafs.

"The general opinion of the watermen upon this point is, that in water meadows which are upon a warm, fandy, or gravelly foil, with no great depth of loam upon them, rude ftrong watering, even in winter, always does harm without any poffible effential fervice. On the contrary, cold ftrong clay land will bear a great deal of water a long time without injury; and boggy, corky, or fpongy foil, will alfo admit of a very large and ftrong body of water upon it; provided the drains are made wide and deep enough to carry it off, without forcing back upon the end of the panes, with great advantage for almoft any length of time at that feafon. The weight and force of the water vailly affifts in compreffing thofe foils, which only want folidity and tenacity to make them produce great burthens of hay: nothing, in their opinion, corrects and improves thofe foils fo much as a very ftrong body of water, kept a confiderable time upon them at that feafon."

Notwithftanding the above reafons, however, Mr Boswell informs us, That he has doubts upon the fubject; nor can he by any means acquiefce in this opinion, unlefs by rude ftrong waters he is permitted to underftand only rather a larger quantity of water conveyed over the land at this early feafon than ought to be ufed in the fpring or fummer: unmanageable waters he believes always hurtful.

"It may be proper juft to add (continues he), that as foon as the hay is carried off the meadows, cattle of any fort except fheep may be put to eat the grafs out of the trenches, and what may be left by the mowers. This perhaps will laft them a week; when the water may be put into the meadows in the manner already defcribed, taking care to mow the long grafs which obftructs the water in the trenches; and this mowing is beft done when the water is in them. Let the weeds, leaves, &c. be taken out and put in heaps, to be carried away into the farm-yards; examine the trenches, make up the breaches, &c. take particular care that the water only dribbles over every part of the panes as thin as poffible, this being the warmeft feafon of the year. The firft watering fould not be fuffered to laft longer than two or three days before it is fhifted off (and if the feafon be wet, perhaps not fo long, as warmth feems to be the greateft requifite after the land is once wet to affift vegetation) to another part or meadow beat out by the cattle, by this time fit to take it. Do by this meadow exactly the fame, and fo by a third and fourth, if as many meadows belong to the occupier. Obferve at all times, when the water is taken out of a meadow, to draw up the drain-fluice hatches; as, without doing that, watering is an injury. By the time that three or four parts are thus regularly watered, the firft will have an after-math, with fuch rich and beautiful verdure as will be aftonifhing; and both quantity and quality will be beyond conception better than if the lands had not been watered.

"Hence we fee why every perfon fould if poffible have three or four meadows that can be watered; for here, while the cattle are eating the firft, the fecond is growing, the third draining, &c. and the fourth under water. In this manner the after-math will in a mild feafon laft till Chriftmas. A reafon was given why the fpring-grafs fould be fed only by fheep or calves; a reafon equally cogent may be given, why the after-grafs ought not to be fed by them, becaufe it will infallibly rot them. "No fheep (fays our author), except thofe which are juft fat, muft ever be fuffered even for an hour in water-meadows except in the fpring of the year; and even then care muft be taken that every part of the meadows have been well watered, and that they are not longer kept in them than the beginning of May. Although at prefent it is unknown what is the occafion of the rot, yet certain it is that even half an hour's feeding in unhealthy ground has often proved fatal. After a fhort time they begin to lofe their flefh, grow weaker and weaker: the beft feeding in the kingdom cannot improve them after they once fall away; and when they die, animalcula like plaice are found in the livers. Scarcely any ever recover from a flight attack; but when farther advanced, it is always fatal. Guard by all means againft keeping the water too long upon the meadow in warm weather; it will very foon produce a white fubftance like cream, which is prejudicial to the grafs, and fhow that it has been too long upon the ground already. If it be permitted to remain a little longer, a thick fcum will fettle upon the grafs of the confiftence of glue, and as tough as leather, which will quite destroy it wherever it is fuffered to be produced. The fame bad effects feem to arife from rude waters; neither can the fcum eafily be got off.

"Rolling meadows in the fpring of the year is an excellent method. It fould be done after Candle-mas, when the meadow has been laid dry a week. It fould be always rolled lengthwife of the panes, up one fide of the trench and down the other. Rolling alfo contributes much to the grafs being cut clofe to the furface when mown, which is no fmall advantage; for the little hillocks, fpewings of worms, ant-hills, &c. are by this means preffed clofe to the ground, which would otherwife obftruct the fcythe and take off its edge; and to avoid that inconvenience, the workmen always mow over them."

MEAL, the flour of grain. The meal or flour of Britain is the fineft and whiteft in the world. The French is ufually browner, and the German browner than that. Our flour keeps well with us, but in carrying abroad it often contracts damp, and becomes bad. All flour is fubject to breed worms; thefe are white in the white flour, and brown in that which is brown: they are therefore not always diftinguifhable to the eye; but when the flour feels damp, and fmells rank and mufty, it may be conjectured that they are there in great abundance.

The colour and the weight are the two things which denote the value of meal or flour; the whiter and the heavier it is, other things being alike, the better it always is. Pliny mentions thefe two characters as the marks of good flour; and tells us, that Italy in his time produced the fineft in the world. This country indeed was famous before his time for

Meadow,
Meal.32
Water
ought not
be kept too
long upon
meadows.33
Advantage
of rolling
meadows.

Meal.

this produce; and the Greeks have celebrated it; and Sophocles in particular says, that no flour is so white or so good as that of Italy. The corn of this country has, however, lost much of its reputation since that time; and the reason of this seems to be, that the whole country being full of sulphur, alum, vitriol, marcasites, and bitumens, the air may have in time affected them so far as to make them diffuse themselves through the earth, and render it less fit for vegetation; and the taking fire of some of these inflammable minerals, as has sometimes happened, is alone sufficient to alter the nature of all the land about the places where they are.

The flour of Britain, though it pleases by its whiteness, yet wants some of the other qualities valuable in flour; the bread that is made of it is brittle and does not hold together, but after keeping a few days becomes hard and dry as if made of chalk, and is full of cracks in all parts; and this must be a great disadvantage in it when intended for the service of an army or the like occasions, where there is no baking every day, but the bread of one making must necessarily be kept a long time.

The flour of Picardy is very like that of Britain; and after it has been kept some time, is found improper for making into paste or dough. The French are forced either to use it immediately on the grinding, or else to mix it with an equal quantity of the flour of Brittany, which is coarser but more unctuous and fatty; but neither of these kinds of flour keep well.

The flour of almost any country will do for the home consumption of the place, as it may be always fresh ground; but the great care to be used in selecting it is in order to the sending it abroad, or furnishing ships for their own use. The saline humidity of the sea-air rusts metals, and fouls every thing on board, if great care be not taken in the preserving them. This also makes the flour damp and mouldy, and is often the occasion of its breeding insects, and being wholly spoiled.

The flour of some places is constantly found to keep better at sea than that of others; and when that is once found out, the whole caution needs only be to carry the flour of those places. Thus the French find that the flour of Poitou, Normandy, and Guienne, all bear the sea-carriage extremely well; and they make a considerable advantage by carrying them to their American colonies.

The choice of flour for exportation being thus made, the next care is to preserve it in the ships: the keeping it dry is the grand consideration in regard to this; the barrels in which it is put up ought to be made of dry and well-seasoned oak, and not to be larger than to hold two hundred weight at the most. If the wood of the barrels have any sap remaining in it, it will moisten and spoil the flour; and no wood is so proper as oak for this purpose, or for making the bins and other vessels for keeping flour in at home, since when once well dried and seasoned it will not contract humidity afterwards. The beech-wood, of which some make their bins for flour, is never thoroughly dry, but always retains some sap. The fir will give the flour a taste of turpentine; and the ash is always subject to be eaten by worms. The oak is preferable, because of its being free from these faults; and when the several

kinds of wood have been examined in a proper manner, there may be others found as fit, or possibly more so, than this for the purpose. The great test is their having more or less sap. See FLOUR and WOOD.

MEAN, in general, denotes the middle between two extremes: thus we say the mean distance, mean proportion, &c.

MEARNS, or KINCARDINSHIRE, a county of Scotland, bounded on the north by Aberdeenshire, on the east by the British Ocean, and on the south-west by Angusshire. In form it resembles a harp, having the lower point towards the south. Its length along the coast is scarce 30 miles; its greatest breadth about 20. Some derive the first name from Mearns a valiant nobleman, who, subduing the country, received it in reward from his prince Kenneth II. Camden, with much probability, supposes it to retain part of the name of the old inhabitants, the Vernicones of Ptolemy, it being common for the Britons in discourse to change the V into M. The other name is taken from its ancient capital *Kincardine*, now an inconsiderable village. The tract of country through which the Dee passes, and the plain along the sea-coast, are well cultivated, and produce much corn and flax. The fields are in many places screened by woods; and the heaths afford sheep-walks and much good pasture for cattle. Near Stonehaven, to the south, are the ruins of Dunottar castle, the ancient seat of the earls Marischal of Scotland, situated on a high perpendicular rock, almost surrounded by the sea. In this neighbourhood is a precipitous cliff over-hanging the sea, called *Fowl's Cleugh*; noted as the resort of kittiwakes, the young of which are much sought after in the hatching season, being esteemed a great delicacy.—At a little distance from Stonehaven, up the river, stands Urie, the birth-place of Barclay the famous apologist for the Quakers. The Quakers have here a burying ground; and in the vicinity are seen the traces of a Roman station. The great valley called *Strathmore* commences here, and extends in a south-west direction nearly as far as Benlomond in Stirlingshire, bounded all along to the north-west by the Grampian mountains.—The village of Fordun, a little south from the centre of the country, is supposed to be the birth-place of the celebrated author of the *Scotichronicon*. St Paddy's church, or Paddy kirk in this neighbourhood, is famous for being the burial-place and residence of St Palladius; whose chapel is still to be seen on the south side of it, 40 feet by 18, now the burial-place of the Halkerton-family. Near the village, and along the river Bervie, the country is flat and well cultivated. The small town of INVERBERVIE was made a royal borough by David Bruce, who landed there with his queen at Craig David after his long retreat into France. Near the village of *Fettercairn* was Den Finnel, the residence of Finella, daughter of a nobleman of large possessions in this country, or, as Major calls her, *countess of Angus*, who was accessory to the murder of Kenneth II. About two miles from this place, on the road-side, is a cairn of a stupendous size and uncommon form, which probably might give name to the parish. About six miles west from Bervie, is situated *Laurence-kirk*, which some years back was only an insignificant village of six or seven houses; but by the judicious and liberal exertions of its proprietor Lord Gardenstone, has

Mean,
Mearns.

Measles. has become a handsome little town, with a right to elect magistrates, and to hold an annual fair and a weekly market. He has established here a flourishing and extensive manufacture of lawn, cambric, linen, and various other articles. He has also freely renounced all the oppressive services due by his tenants; services which have been so long and so justly complained of as a check to agriculture in many parts of Scotland. —The north-west part of the shire, being mountainous, is more employed in pasture than in cultivation.

MEASLES, a cutaneous disease attended with a fever, in which there is an appearance of eruptions that do not tend to a suppuration. See (the *Index* subjoined to) **MEDICINE**.

MEASURE, in geometry, denotes any quantity assumed as one, or unity, to which the ratio of the other homogeneous or similar quantities is expressed.

MEASURE, in a legal and commercial sense, denotes a certain quantity or proportion of any thing, bought, sold, valued, or the like.

It is necessary, for the convenience of commerce, that an uniformity should be observed in weights and measures, and regulated by proper standards. A foot-rule may be used as a standard for measures of length, a bushel for measures of capacity, and a pound for weights. There should be only one authentic standard of each kind, formed of the most durable materials, and kept with all possible care. A sufficient number of copies, exactly corresponding to the principal standard, may be distributed for adjusting the weights and measures that are made for common use. There are several standards of this kind both in England and Scotland. See the article *WEIGHTS and Measures*.

If any one of the standards above-mentioned be justly preserved, it will serve as a foundation for the others, by which they may be corrected if inaccurate, or restored if entirely lost. For instance, if we have a standard foot, we can easily obtain an inch, and can make a box which shall contain a cubical inch, and may serve as a standard for measures of capacity. If it be known that a pint contains 100 cubical inches, we may make a vessel five inches square, and four inches deep, which will contain a pint. If the standard be required in any other form, we may fill this vessel with water, and regulate another to contain an equal quantity. Standards for weights may be obtained from the same foundation; for if we know how many inches of water it takes to weigh a pound, we have only to measure that quantity, and the weight which balances it may be assumed as the standard of a pound.

Again, if the standard of a pound be given, the measure of an inch may be obtained from it: for we may weigh a cubical inch of water, and pour it into a regular vessel; and having noticed how far it is filled, we may make another vessel of like capacity in the form of a cube. The side of this vessel may be assumed as the standard for an inch; and standards for a foot, a pint, or a bushel, may be obtained from it. Water is the most proper substance for regulating standards; for all other bodies differ in weight from others of the same kind; whereas it is found by experience that spring and river water, rain, and melted

snow, and all other kinds, have the same weight; and this uniformly holds in all countries when the water is pure, alike warm, and free from salt and minerals.

Thus, any one standard is sufficient for restoring all the rest. It may further be desired to hit on some expedient, if possible, for restoring the standards, in case that all of them should ever fall into disorder, or should be forgotten, through the length of time, and the vicissitudes of human affairs. This seems difficult, as no words can convey a precise idea of a foot-rule, or a pound weight. Measures, assumed from the dimensions of the human body, as a foot, a hand-breadth, or a pace, must nearly be the same in all ages, unless the size of the human race undergo some change; and therefore, if we know how many square feet a Roman acre contained, we may form some judgment of the nature of the law which restricted the property of a Roman citizen to seven acres; and this is sufficient to render history intelligible; but it is too inaccurate to regulate measures for commercial purposes. The same may be said of standards, deduced from the measure of a barley-corn, or the weight of a grain of wheat. If the distance of two mountains be accurately measured and recorded, the nature of the measure used will be preserved in a more permanent manner than by any standard; for if ever that measure fall into disuse and another be substituted in its place, the distance may be measured again, and the proportion of the standards may be ascertained by comparing the new and ancient distances.

But the most accurate and unchangeable manner of establishing standards is, by comparing them with the length of pendulums. The longer a pendulum is, it vibrates the slower; and it must have one precise length in order to vibrate in a second. The slightest difference in length will occasion a difference in the time; which will become abundantly sensible after a number of vibrations, and will be easily observed if the pendulum be applied to regulate the motion of a clock. The length of a pendulum which vibrates seconds in London is about $39\frac{1}{8}$ inches, is constantly the same at the same place; but it varies a little with the latitude of the place, being shorter as the latitude is less. Therefore, though all standards of weights and measures were lost, the length of a second pendulum might be found by repeated trials: and if the pendulum be properly divided, the just measure of an inch will be obtained; and from this all other standards may be restored. See *Whitehurst on Invariable MEASURES*.

Measures are various, according to the various kinds and dimensions of the things measured.—Hence arise lineal or longitudinal measures, for lines or lengths; square measures, for areas or superficies; and solid or cubic measures, for bodies and their capacities: all which again are very different in different countries and in different ages, and even many of them for different commodities. Whence arise other divisions of ancient and modern measures, domestic and foreign ones, dry measures, liquid measures, &c.

I. *Long Measures, or Measures of Application.*

1.] *The English and Scotch Standards.*

The English lineal standard is the yard, containing 3 English feet; equal to 3 Paris feet 1 inch and $\frac{1}{2}$

Measure.

of an inch, or $\frac{7}{8}$ of a Paris ell. The use of this measure was established by Henry I. of England, and the standard taken from the length of his own arm. It is divided into 36 inches, and each inch is supposed equal to 3 barley-corns. When used for measuring cloth, it is divided into four quarters, and each quarter subdivided into 4 nails. The English ell is equal to a yard and a quarter, or 45 inches, and is used in measuring linens imported from Germany and the Low-Countries.

The Scots *elwand* was established by king David I. and divided into 37 inches. The standard is kept in the council-chamber of Edinburgh, and being compared with the English yard, is found to measure $37\frac{1}{2}$ inches; and therefore the Scots inch and foot are larger than the English, in the proportion of 180 to 185; but this difference being so inconsiderable, is seldom attended to in practice. The Scots ell, though forbidden by law, is still used for measuring some coarse commodities, and is the foundation of the land-measure of Scotland.

Itinerary measure is the same both in England and Scotland. The length of the chain is 4 poles, or 22 yards; 80 chains make a mile. The old Scots computed miles were generally about a mile and a half each.

The reel for yarn is $2\frac{1}{2}$ yards, or 10 quarters, in circuit; 120 threads make a cut, 12 cuts make a hasp or hank, and 4 hanks make a spindle.

2.] The French Standard is the aune or ell, containing 3 Paris feet 7 inches 8 lines, or 1 yard $\frac{2}{3}$ English; the Paris foot-royal exceeding the English by $\frac{68}{1000}$ parts, as in one of the following tables. This ell is divided two ways, viz. into halves, thirds, sixths, and twelfths; and into quarters, half-quarters, and sixteenths.

This ell holds throughout the greatest part of France; excepting at Troyes in Champagne, at Arc in the Barrois, and in some parts of Picardy and Burgundy, where the ell contains only 2 feet 5 inches 1 line; in Bretagne, where it contains 4 feet 2 inches 11 lines; and at St Genoux in Berry, where it exceeds the Paris ell by 8 lines. See ELL. But in Languedoc, particularly at Marseilles, Montpellier, Thoulouse in Provence, and in Guienne, they measure by the canna, which at Thoulouse and in Guienne contains 5 Paris feet 5 inches and 6 lines; or one Paris ell and a half. But at Montpellier, and throughout the Lower Languedoc, as also in Provence and Avignon, and even Dauphine, the canna is 6 feet and 9 lines, or 1 Paris ell and $\frac{3}{4}$. See CANNA.

We have lately had some accurate comparisons between some of the French weights and measures and those of England, the result of which is, (1.) The Paris half toise, as set off on the standard kept in the Royal Society; contains of English inches by the same standard 38.355, whence it appears, that the English yard and foot is, to the Paris half toise and foot, nearly as 107 to 114; for as 107 to 114, so is 36 to 38.35514.

(2.) The Paris 2 marc, or 16 ounce weight, weighs English Troy grains 7560; whence it appears, that the English Troy pound of 12 ounces, or 5760 grains, is to the Paris 2 marc, or 16 ounce weight, as 16 to 21; that the Paris ounce weighs English Troy grains

472.5, and that consequently, the English Troy ounce is to the Paris ounce as 64 is to 63.

(3.) The English Avoirdupois pound weighs Troy grains 7004; whence the Avoirdupois ounce, whereof 16 make a pound, is found equal to 437.75 Troy grains.—And it follows, that the Troy pound is to the Avoirdupois pound as 88 to 107 nearly; for as 88 to 107, so is 5760 to 7003.636: that the Troy ounce is to the Avoirdupois ounce, as 80 to 73 nearly; for as 80 to 73, so is 480 to 438. And, lastly, that the Avoirdupois pound and ounce is to the Paris two marc weight and ounce, as 63 to 68 nearly; for as 63 to 68, so is 7004 to 7559.873. See WEIGHT.

(4.) The Paris foot expressed in decimals, is equal to 1.0654 of the English foot, or contains 12.785 English inches. See FOOT.

3.] The standard in *Holland, Flanders, Sweden*, a good part of *Germany*, many of the Hans-towns, as *Dantzick*, and *Hamburg*, and at *Geneva, Franckfort*, &c. is likewise the ell: but the ell, in all these places, differs from the Paris ell. In Holland, it contains one Paris foot eleven lines, or four sevenths of the Paris ell. The Flanders ell contains two feet one inch five lines and half a line; or seven-twelfths of the Paris ell. The ell of Germany, Brabant, &c. is equal to that of Flanders.

4.] The Italian measure is the braccchio, brace, or fathom. This obtains in the states of Modena, Venice, Florence, Lucca, Milan, Mantua, Bologna, &c. but is of different lengths. At Venice, it contains one Paris foot eleven inches three lines, or eight fifteenths of the Paris ell. At Boulogna, Modena, and Mantua, the brace is the same as at Venice. At Lucca it contains one Paris foot nine inches ten lines, or half a Paris ell. At Florence, it contains one foot nine inches four lines, or forty-nine hundredths of a Paris ell. At Milan, the brace for measuring of silks is one Paris foot seven inches four lines, or four-ninths of a Paris ell: that for woollen cloths is the same with the ell of Holland. Lastly, at Bergama, the brace is one foot seven inches six lines, or five-ninths of a Paris ell. The usual measure at Naples, however, is the canna, containing six feet ten inches and two lines, or one Paris ell and fifteen seventeenths.

5.] The Spanish measure is the vara or yard, in some places called the barra; containing seventeen twenty-fourths of the Paris ell. But the measure in Castile and Valencia is the pan, span, or palm; which is used, together with the canna, at Genoa. In Aragon, the vara is equal to a Paris ell and a half, or five feet five inches six lines.

6.] The Portuguese measure is the cavedos, containing two feet, eleven lines, or four-sevenths of a Paris ell; and the varra, a hundred and six whereof make a hundred Paris ells.

7.] The Piedmontese measure is the ras, containing one Paris foot nine inches ten lines, or half a Paris ell. In Sicily, their measure is the canna, the same with that of Naples.

8.] The Muscovite measures are the cubit, equal to one Paris foot four inches two lines; and the arcin, two whereof are equal to three cubits.

9.] The Turkish and Levant measures are the picq, containing two feet two inches and two lines, or three fifths of the Paris ell. The Chinese measure, the

cobre.

Measure.

Measure. cobre; ten whereof are equal to three Paris ells. In Persia, and some parts of the Indies, the gueze, whereof there are two kinds; the royal gueze, called also the *gueze monkelfer*, containing two Paris feet ten inches eleven lines, or four-fifths of the Paris ell; and the shorter gueze, called simply *gueze*, only two thirds of the former. At Goa and Ormuz, the measure is the vara, the same with that of the Portuguese, having been introduced by them. In Pegu, and some other parts of the Indies, the cando or candi, equal to

the ell of Venice. At Goa, and other parts, they use a larger cando, equal to seventeen Dutch ells; exceeding that of Babel and Balfora by $\frac{7}{8}$ per centum, and the vera by $6\frac{1}{2}$. In Siam, they use the ken, short of three Paris feet by one inch. The ken contains two foks, the fok two keubs, the keub twelve niuous or inches, the niou to be equal to eight grains of rice, i. e. to about nine lines. At Camboia, they use the haster; in Japan, the tatam; and the span on some of the coasts of Guinea.

TABLES of LONG Measure.

Barley-corn										1 ENGLISH.									
3 Inch																			
9 3 Palm																			
27 9 3 Span																			
36 12 4 1 $\frac{1}{3}$ Foot																			
54 18 6 2 1 $\frac{1}{2}$ Cubit																			
108 36 12 4 3 2 Yard																			
180 60 20 6 $\frac{2}{3}$ 5 3 $\frac{1}{3}$ 1 $\frac{2}{3}$ Pace																			
216 72 24 8 6 4 2 1 $\frac{1}{5}$ Fathom																			
594 198 66 22 16 $\frac{1}{2}$ 11 5 $\frac{1}{2}$ 3 $\frac{3}{10}$ 2 $\frac{1}{4}$ Pole																			
23760 7920 2640 880 660 440 220 132 110 40 Furlong																			
190080 63360 21120 7040 5280 3520 1760 1056 880 320 8 Mile.																			

2. *SCRIPTURE Measures reduced into English.*

2. SCRIPTURE Measures reduced into English.										Eng. feet.	Inch Dec	
Digit										0	0.912	
4	Palm									0	3.648	
12	3	Span									0	10.944
24	6	2	Cubit							1	9.888	
96	24	8	4	Fathom							7	3.552
144	36	12	6	1½	Ezechiel's reed					10	11.328	
192	48	16	8	2	1⅓	Arabian pole					14	7.104
1920	480	160	80	20	13⅓	10	Schœnus, or measuring line			145	11.04	

3. *The SCRIPTURE Itinerary Measures.*

					Eng.	Miles.	Paces.	Feet.
Cubit	—				—	0	0	1.824
400	Stadium				—	0	145	4.6
2000	5	Sab. day's journey			—	0	729	3.000
4000	10	2	Eastern mile		—	1	403	1.000
12000	30	6	3	Parasani	—	4	153	3.000
96000	240	48	24	8	a day's journey	33	172	4.000

Measure.

Measure.

4. GRECIAN.										Paces.	feet.	dec.
Dactylus, digit										0	0	0.7554 $\frac{1}{8}$
4 Doron, dochme										0	0	3.0218 $\frac{1}{4}$
10	2 $\frac{1}{2}$	Lichas								0	0	7.5546 $\frac{7}{8}$
11	2 $\frac{1}{4}$	1 $\frac{1}{10}$	Orthodoron							0	0	8.3101 $\frac{2}{5}$
12	3	1 $\frac{1}{5}$	1 $\frac{1}{11}$	Spithame						0	0	9.6656 $\frac{1}{4}$
16	4	1 $\frac{6}{10}$	1 $\frac{5}{11}$	1 $\frac{1}{11}$	Foot					0	1	0.0875
18	4 $\frac{1}{2}$	1 $\frac{4}{5}$	1 $\frac{7}{11}$	1 $\frac{1}{2}$	1 $\frac{1}{8}$	Cubit				0	1	1.5984 $\frac{3}{8}$
20	5	2	1 $\frac{9}{11}$	1 $\frac{2}{3}$	1 $\frac{1}{4}$	1 $\frac{1}{9}$	Pygon			0	1	3.109 $\frac{3}{8}$
24	6	2 $\frac{2}{5}$	2 $\frac{2}{11}$	2	1 $\frac{1}{2}$	1 $\frac{1}{3}$	1 $\frac{1}{5}$	Cubit larger		0	1	6.13125
96	24	9 $\frac{3}{5}$	8 $\frac{8}{11}$	8	6	5 $\frac{1}{3}$	4 $\frac{4}{5}$	4 Pace		0	6	0525
9600	2400	960	872 $\frac{8}{11}$	800	600	533 $\frac{1}{3}$	480	400	100	100	4	4.5
176800	19200	7680	6981 $\frac{9}{11}$	6400	6800	4266 $\frac{2}{3}$	3840	3200	800	8	8	0

5. ROMAN.										Paces.	feet.	dec.
Digitus transversus										0	0	0.725 $\frac{1}{2}$
1 $\frac{1}{2}$	Uncia									0	0	0.967
4	3	Palms minor								0	0	2.901
16	12	4	Pes							0	0	11.604
20	15	5	1 $\frac{1}{4}$	Palmipes						0	1	2.505
24	18	6	1 $\frac{1}{2}$	1 $\frac{1}{2}$	Cubitus					0	1	5.406
40	30	10	2 $\frac{1}{2}$	2	1 $\frac{2}{3}$	Gradus				0	2	5.01
80	60	20	5	4	3 $\frac{1}{2}$	2	Passus			0	4	10.02
10000	7500	2500	625	500	416 $\frac{2}{3}$	250	125	Stadium.		120	4	4.5
80000	60000	20000	5000	4000	3333 $\frac{1}{3}$	2000	1000	8	Milliare		967	0

6. Proportions of several Long Measures to each other, by M. Picard.

The Rhinland or Leyden foot (12 whereof make the Rhinland perch) supposed	696
The English foot	675 $\frac{1}{2}$
The Paris foot	720
The Amsterdam foot, from that of Leyden, by Snellius	629
The Danish foot (two whereof make the Danish ell)	701 $\frac{8}{10}$
The Swedish foot	658 $\frac{1}{4}$
The Brussels foot	609 $\frac{1}{2}$
The Dantzic foot, from Hevelius's Selenographia	636
The Lyons foot, by M. Auzout	757 $\frac{2}{3}$
The Bologna foot, by the same	843

The braccio of Florence, by the same, and Father Merfenne

1290

The palm of the architects at Rome, according to the observations of Messrs Picard and Auzout

494 $\frac{1}{2}$

The Roman foot in the Capitol, examined by Messrs Picard and Auzout

653 or 653 $\frac{1}{2}$

The same from the Greek foot

652

From the vineyard Mattei

657 $\frac{1}{2}$

From the palm

658 $\frac{1}{2}$

From the pavement of the pantheon, supposed to contain ten Roman feet

653

From a slip of marble in the same pavement, supposed to contain three Roman feet

650

From the pyramid of Cestius, supposed to contain 95 Roman feet

653 $\frac{1}{2}$

From

Measure. From the diameters of the columns in the arch of Septimius Severus - - - 653 $\frac{1}{2}$
 From a slip of porphyry in the pavement of the pantheon - - - 653 $\frac{1}{2}$
 See on this subject Phil. Transf. Vol. LI. art. 69. p. 774.

7. *Proportions of the Long Measures of several nations to the English foot, taken from Mr Graves, Auzout, Picard, and Eifenchmid. See Foot.*

The English standard foot being divided into 1000 equal parts, the other measures will have the proportions to it, which follow:

	Feet.	Inches.
English foot	1000	12
Paris foot	1068	12,816
Venetian foot	1162	13,944
Rhinland foot	1033	12,396
Straßburgh foot	952	11,424
Norimbergh foot	1000	12
Dantzick foot	944	11,328
Danish foot	1042	12,504
Swedish foot	977 $\frac{1}{4}$	11,733
Derahor cubit of Cairo	1824	21,888
Persian arish	3197	38,364
Greater Turkish pike	2200	26,4
Lesser Turkish pike	2131	25,572
Braccio at Florence	1913	22,956
Braccio for woollen at Siena	1242	14,904
Braccio for linen at Siena	1974	23,688
Canna at Naples	6880	82,56
Vera at Almaria and Gibraltar	2760	33,12
Palmo di Archtetti at Róme	732	87,84
Canna di Archtetti	7320	87,84
Palmo di braccio di mercantia	695 $\frac{1}{2}$	8,346
Genoa palm	815	9,78
Bolognian foot	1250	15
Antwerp ell	2283	27,396
Amsterdam ell	2268	27,216
Leyden ell	2260	27,12
Paris draper's ell	3929	47,148
Paris mercer's ell	3937	47,244

8. *Different Itinerary Measures.*

A French league is about	2 $\frac{1}{4}$	English miles.
A German mile	4	ditto
A Dutch mile	3 $\frac{1}{2}$	ditto
An Italian mile	1 $\frac{1}{2}$	ditto
A Spanish league	3 $\frac{2}{3}$	ditto
A Russian verst	$\frac{1}{4}$	ditto

II. *SQUARE, SUPERFICIAL, or LAND Measure.*

1.] *English* square measures are raised from the yard of 36 inches multiplied into itself, and thus producing 1296 square inches in the square yard; the divisions of this are square feet and inches; and the multiples, poles, roods, and acres. Because the length of a pole is 5 $\frac{1}{2}$ yards, the square of the same contains 30 $\frac{1}{4}$ square yards. A square mile contains 640 square acres. In measuring fens and woodlands, 18 feet are generally allowed to the pole, and 21 feet in forest lands.

A hide of land, frequently mentioned in the earlier part of the English history, contained about 100 arable acres; and 5 hides were esteemed a knight's fee. At

the time of the Norman conquest, there were 243,600 hides in England.

2.] *Scotch* square or land measure is regulated by the Scotch ell: 36 square ells = 1 fall, 40 falls = 1 rood, 4 roods = 1 acre.—The proportion between the Scotch and English acre, supposing the feet in both measures alike, is as 1369 to 1089, or nearly as 5 to 4. If the difference of the feet be regarded, the proportion is as 10,000 to 7869. The length of the chain for measuring land in Scotland is 24 ells, or 74 feet.—A husband-land contains 6 acres of fock and scythe land, that is, of land that may be tilled with a plough or mown with a scythe: 13 acres of arable land make one ox-gang, and 4 ox-gangs make a pound-land of old extent.

3.] *French* square measures are regulated by 12 square lines in the inch square; 12 inches in the foot, 22 feet in the perch, and 100 perches in the arpent or acre.

TABLES of SQUARE Measure.

I. ENGLISH.

Inches	Feet	Yards	Paces	Poles	Rood	Acres
144	1					
1296	9	1				
3600	25	2 $\frac{1}{2}$				
39204	272 $\frac{1}{4}$	30 $\frac{1}{4}$	10.89			
1568160	10890	1210	435.6	40		
6272640	43560	4840	1743.6	160	4	1

2. *Grecian* square measures were the plethron or acre, by some said to contain 1444, by others 10,000 square feet; and aroura the half of the plethron. The aroura of the Egyptians was the square 100 cubits.

3. *Roman* square measure reduced to English. The integer was the jugerum or acre, which the Romans divided like the libra or as: thus the jugerum contained

	square feet.	scruples.	roods.	Eng. poles.	square feet.
As	28800	288	2	18	250.05
Deunx	26400	264	2	10	183.85
Dextans	24000	240	2	2	117.64
Dodrans	21600	216	1	34	51.42
Bes	19200	192	1	25	257.46
Septunx	16800	168	1	17	191.25
Semis	14400	144	1	9	125.03
Quincunx	12000	120	1	1	58.82
Triens	9600	96	0	32	264.85
Quadrans	7200	72	0	24	198.64
Sextans	4800	48	0	16	132.43
Uncia	2400	24	0	8	66.21

Note, Actus major was 14,400 square feet, equal to a semis; clima, 3600 square feet, equal to fescuncia; and actus minimus equal to a sextans.

Measure

III. *CUBICAL Measures*, or Measures of Capacity, for LIQUIDS.

1.] The *English* measures were originally raised from troy-weight: it being enacted by several statutes, that eight pounds troy of wheat, gathered from the middle of the ear, and well dried, should weigh a gallon of wine measure, the divisions and multiples whereof were to form the other measures; at the same time it was also ordered, that there should be but one liquid measure in the kingdom: yet custom has prevailed, and there having been introduced a new weight, viz. the avoirdupois, we have now a second standard gallon adjusted thereto, and therefore exceeding the former in the proportion of the avoirdupois weight to troy weight. From this latter standard are raised two several measures, the one for ale, the other for beer. The sealed gallon at Guildhall, which is the standard for wines, spirits, oils, &c. is supposed to contain 231 cubic inches; and on this supposition the other measures raised therefrom, will contain as in the table underneath: yet, by actual experiment, made in 1688, before the lord-mayor and the commissioners of excise, this gallon was found to contain only 224 cubic inches: it was however agreed to continue the common supposed contents of 231 cubic inches; so that all computations stand on their old footing. Hence, as 12 is to 231, so is $14\frac{1}{2}$ to $281\frac{1}{2}$ the cubic inches in the ale-gallon: but in effect the ale-quart contains $70\frac{1}{2}$ cubic inches, on which principle the ale and beer gallon will be 282 cubic inches. The several divisions and multiples of these measures, and their proportions, are exhibited in the tables underneath.

The barrel for ale in London is 32 gallons, and the barrel for beer 36 gallons. In all other places of England, the barrel, both for ale and beer, is 34 gallons.

2.] *Scotch* liquid measure is founded on the pint. The Scotch pint was formerly regulated by a standard jug of cast metal, the custody of which was committed to the borough of Stirling. This jug was supposed to contain 105 cubic inches; and though, after several careful trials, it has been found to contain only about $103\frac{1}{2}$ inches; yet, in compliance with established custom, founded on that opinion, the pint *stoups* are still regulated to contain 105 inches, and the customary ale measures are about $\frac{1}{6}$ above that standard. It was enacted by James I. of Scotland, that the pint should contain 41 ounces Trone weight of the clear water of Tay, and by James VI. that it should contain 55 Scots Troy ounces of the clear water of Leith. This affords another method of regulating the pint, and also ascertains the ancient standard of the Trone weight. As the water of Tay and Leith are alike, the Trone weight must have been to the Scots Troy weight as 55 to 41; and therefore, the pound Trone must have contained about $21\frac{1}{2}$ ounces Scots Troy.

4 gills	= 1 mutchkin.
2 mutchkins	= 1 chopin.
2 chopins	= 1 pint.
2 pints	= 1 quart.
4 quarts	= 1 gallon.

* The Scotch quart contains 210 inches; and is, therefore, about $\frac{1}{6}$ less than the English wine gallon, and about $\frac{1}{4}$ less than the ale-gallon.

3]. As to the liquid measures of foreign nations, it is to be observed, that their several vessels for wine, vinegar, &c. have also various denominations according to their different sizes and the places wherein they are used. The woeders of Germany, for holding Rhenish and Moselle wines, are different in their gauges; some containing 14 aumes of Amsterdam measure, and others more or less. The aume is reckoned at Amsterdam for 8 steckans, or 20 verges, or for $\frac{1}{2}$ of a ton of 2 pipes; or 4 barrels of French or Bourdeaux, which $\frac{1}{6}$ at this latter place is called *tiercon*, because 3 of them make a pipe or 2 barrels, and 6 the said ton. The steckan is 16 mingles, or 32 pints; and the verge is, in respect of the said Rhenish and Moselle, and some other sorts of wine, 6 mingles; but, in measuring brandy, it consists of $6\frac{1}{2}$ mingles. The aume is divided into 4 anckers, and the ancker into 2 steckans, or 32 mingles. The ancker is taken sometimes for $\frac{1}{4}$ of a ton, or 4 barrels; on which footing the Bourdeaux-barrel ought to contain at Amsterdam (when the cask is made according to the just gauge) $12\frac{1}{2}$ steckans, or 200 mingles wine and lees; or 12 steckans, or 192 mingles racked wine; so that the Bourdeaux-ton of wine contains 50 steckans, or 800 mingles, wine and lees; and 48 steckans, or 768 mingles of pure wine. The barrels or poinçons of Nantes and other places on the river Loire, contain only 12 steckans Amsterdam measure. The wine-ton of Rochelle, Cognac, Charente, and the Isle of Rhe, differs very little from the ton of Bourdeaux, and consequently from the barrels and pipes. A ton of wine of Chalosse, Bayonne, and the neighbouring places, is reckoned 60 steckans, and the barrel 15, Amsterdam-measure.

The muid of Paris contains 150 quarts, or 300 pints, wine and lees; or 280 pints clear wine; of which muids 3 make a ton, and the fractions are

The muid	} containing	36 setiers
The setier		4 quarts
The quart		2 pints
The pint		2 chopins
The chopin		2 demi-setiers
The demi-setier		2 poissons.

The muid is also composed of pipes, or poinçons, quarteaux, queves, and demiqueves: those poinçons of Paris and Orleans contain about 15 steckans Amsterdam measure, and ought to weigh with the cask 666 lb. a little more or less. In Provence they reckon by millerols, and the millerole of Toulon contains 66 Paris pints, or 100 pints of Amsterdam, nearly; and the Paris pint is nearly equal to the English wine-quart.

The butts or pipes from Cadiz, Malaga, Alicant, Benecarlo, Saloe, and Mataro, and from the Canaries, from Lisbon, Oporto, and Fayal, are very different in their gauges, though in affreightments they are all reckoned two to the ton.

Vinegar is measured in the same manner as wine; but the measures for brandies are different: these spirits from France, Spain, Portugal, &c. are generally shipped in large casks called *pipes*, *butts*, and *pieces*, according to the places from whence they are reported, &c. In France, brandy is shipped in casks called *pieces* at Bourdeaux, and *pipes* at Rochelle, Cognac, the isle of Rhé, and other neighbouring places,

Measure.

Measure. places, which contain some more and some less, even from 60 to 90 Amsterdam verges or veertels, according to the capacity of the vessels, and the places they come from, which being reduced into barrels will stand as follows, viz.

At Rochelle, Cognac, the Isle of Rhé, and the country of Aunis	27 Veertels	} per barrel.
At Nants, and several places of Bre- tagne and Anjou	29 Veertels	
At Bourdeaux, and different parts of Guienne	32 Verges	
At Amsterdam, and other cities of Holland	30 Veertels	
At Hamburgh and Lubeck	30 Verges	
At Embden	27 Verges	

In Provence and Languedoc, brandy is sold by the quintal, the casks included; and at Bruges in Flanders, the verges are called *sesters* of 16 stops each, and the spirit is sold at so much per stop.

Olive oil is also shipped in casks of various sizes, according to the custom of the places where it is embarked, and the conveniency of stowage. In England it is sold by the ton of 236 gallons; and at Amsterdam by the ton of 717 mingles, or 1434 pints. In Provence it is sold by milleroles of 66 Paris-pints; from Spain and Portugal it is brought in pipes or butts, of different gauges; at the first place it is sold by roves, whereof 40 go to the butt; and at the latter place by almoudas, whereof 26 makes a pine. Train oil is sold in England by the ton, at Amsterdam by the barrel.

TABLES of LIQUID MEASURE.

I. ENGLISH.

Solid inches.

[Wine.]

28 $\frac{1}{8}$	Pint								
231	8	Gallon							
4158	144	18	Rundlet						
7276 $\frac{1}{2}$	252	31 $\frac{1}{2}$	1 $\frac{3}{4}$	Barrel					
9702	336	42	2 $\frac{1}{2}$	1 $\frac{1}{2}$	Tierce				
14553	504	63	3 $\frac{1}{2}$	2	1 $\frac{1}{2}$	Hogshead			
19279	672	84	4 $\frac{1}{2}$	2 $\frac{2}{3}$	2	1 $\frac{1}{3}$	Puncheon		
29106	1008	126	7	4	3	2	1 $\frac{1}{2}$	Butt or pipe	
58212	2016	252	14	8	6	4	3	2	Tun.

Pints

[Ale.]

Pints

[Beer.]

8	Gallon								
64	8	Firkin							
128	16	2	Kilderkin						
256	32	4	2	Barrel					
512	64	8	4	2	Hog.				

8 Gallon.

72 9 Firkin

144 18 2 Kilderkin

288 36 4 2 Barrel

576 72 8 4 2 Hog.

2. JEWISH reduced to English Wine-measure.

Caph	-	-	-	-	-	-	-	-	-
1 $\frac{1}{3}$	Log	-	-	-	-	-	-	-	-
5 $\frac{1}{3}$	4	Cab	-	-	-	-	-	-	-
16	12	3	Hin	-	-	-	-	-	-
32	24	6	2	Seah	-	-	-	-	-
96	72	18	6	3	Bath, or Epha	-	-	-	-
960	720	180	60	30	10	Coron, or Chomer.	-	-	-

Gall.	Pints	Solid inches.
0	0 $\frac{1}{8}$	0.177
0	0 $\frac{5}{8}$	0.211
0	3 $\frac{1}{2}$	0.844
1	2	2.533
2	4	5.067
7	4	15.2
75	5	7.625

3. ATTIC

Measure.

Measure.

3. ATTIC reduced to English Wine-measure.

										Gal.	Pints.	Sol. inch.	Dec.
Cochliarion										0	$\frac{1}{128}$	0.0356	$\frac{5}{128}$
2	Cheme									0	$\frac{1}{64}$	0.0712	$\frac{5}{64}$
2	$1\frac{1}{4}$	Mystron								0	$\frac{1}{48}$	0.0894	$\frac{1}{48}$
5	$2\frac{1}{2}$	2	Conche							0	$\frac{1}{24}$	0.1781	$\frac{1}{24}$
10	5	4	2	Cyathos						0	$\frac{1}{12}$	0.3561	$\frac{1}{12}$
15	$7\frac{1}{2}$	6	3	$1\frac{1}{2}$	Oxybaphon					0	$\frac{1}{8}$	0.535	$\frac{1}{8}$
60	30	24	12	6	4	Cotyle				0	$\frac{1}{2}$	2.141	$\frac{1}{2}$
120	60	48	24	12	8	2	Xestes			0	1	4.283	
720	360	288	144	72	48	12	6	Chous		0	6	25.698	
8640	4320	3456	1728	864	576	144	72	12	Metretes	10	2	19.629	

4. ROMAN reduced to English Wine-measure.

										Gal.	Pints	Sol. inch.	Dec.
Ligula										0	$\frac{1}{48}$	0.1171	$\frac{1}{48}$
4	Cyathus									0	$\frac{1}{12}$	0.469	$\frac{1}{12}$
6	$1\frac{1}{2}$	Acetabulum								0	$\frac{1}{8}$	0.704	$\frac{1}{8}$
12	3	2	Quartarius							0	$\frac{1}{4}$	1.409	
24	6	4	2	Hemina						0	$\frac{1}{2}$	2.818	
48	12	8	4	2	Sextarius					0	1	5.636	
288	72	48	24	12	6	Congius				0	7	4.942	
1152	288	192	96	48	24	4	Urna			3	$4\frac{1}{2}$	5.33	
2304	576	384	192	96	48	8	2	Amphora		7	1	10.66	
46080	11520	7680	3840	1920	960	160	40	20	Culeus	143	3	11.095	

IV. Measures of Capacity for things DRY.

1.] *English* dry or corn measure. The standard for measuring corn, salt, coals, and other dry goods, in England, is the Winchester gallon, which contains $272\frac{1}{4}$ cubic inches. The bushel contains 8 gallons, or 2178 inches. A cylindrical vessel, $18\frac{1}{2}$ inches diameter, and 8 inches deep, is appointed to be used as a bushel in levying the malt-tax. A vessel of these dimensions is rather less than the Winchester bushel of 8 gallons, for it contains only 2150 inches; though probably there was no difference intended. The denominations of dry measure commonly used, are given in the first of the subjoined tables. Four quarters corn make a chaldron; 5 quarters make a wey or load, and 10 quarters make a ton. In measuring sea-coal, 5 pecks

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make a bushel, 9 bushels make a quarter or vatt, 4 quarters make a chaldron, and 21 chaldrons make a score.

40 feet hewn timber make a load.
 50 feet unhewn timber make a load.
 32 gallons make a herring barrel.
 42 gallons make a salmon barrel.
 1 cwt. gun-powder makes a barrel.
 256 lb soap make a barrel.
 10 dozen candles make a barrel.
 12 barrels make a last.

2.] *Scotch* dry measure. There was formerly only one measure of capacity in Scotland; and some commodities were heaped, others *straked*, or measured exactly to the capacity of the standard. The method of heaping was afterwards forbidden as unequal, and a larger

Measure. larger measure appointed for such commodities as that custom had been extended to.

The wheat-firLOT, used also for rye, pease, beans, salt, and grass-seeds, contains 21 pints 1 mutchkin, measured by the Stirling jug. The barley firLOT, used also for oats, fruit, and potatoes, contains 31 pints. A different method of regulating the firLOT was appointed, from the dimensions of a cylindrical vessel. The diameter for both measures was fixed at $19\frac{1}{2}$ inches, the depth $7\frac{1}{2}$ inches for the wheat-firLOT, and $10\frac{1}{2}$ for the barley-firLOT. A standard constructed by these measures is rather less than when regulated by the pint; and as it is difficult to make vessels exactly cylindrical, the regulation by the pint has prevailed, and the other method gone into disuse.

If the Stirling jug contain $103\frac{1}{2}$ inches, the wheat-firLOT will contain 2109 inches; which is more than 2 per cent. larger than the legal malt-bushel of England, and about 1 per cent. larger than the Winchester bushel: and the barley-firLOT will contain 3208 inches. The barley-boll is nearly equal to six legal malt bushels.

In Stirlingshire, 17 pecks are reckoned to the boll: in Invernesshire, 18 pecks: in Ayrshire, the boll is the same as the English quarter. And the firLOTS, in many places, are larger than the Linlithgow standard.

3.] *French dry*, are, the litron, bushel, minot, mine, septier, muid, and tun. The litron is divided into two demilitrons, and four quarter-litrons, and contains 36 cubic inches of Paris. By ordonnance, the litron is to be three inches and a half high, and three inches 10 lines broad. The litron for salt is larger, and is divided into two halves, four quarters, eight demi-quarters, and 16 mesurettes. The French bushel is different in different jurisdictions. At Paris it is divided into demi-bushels; each demi-bushel into two quarts; the quart into two half-quarts; and the half-quart into two litrons: so that the bushel contains 16 litrons. By ordonnance the Paris bushel is to be eight inches two lines and a half high, and ten inches broad, or in diameter within-side. The minot consists of three bushels, the mine of two minots or six bushels, the septier of two mines or 12 bushels, and the muid of 12 septiers, or an 144 bushels. The bushel of oats is estimated double that of any other grain; so that there go 24 bushels to make the septier, and 288 to make the muid. It is divided into four picotins, the picotin containing two quarts, or four litrons. The bushel for salt is divided into two half-bushels, four quarters, eight half-quarters, and 16 litrons; four bushels make a minot, 16 a septier, and 192 a muid. The bushel for wood is divided into halves, quarters, and half-quarters. Eight bushels make the minot, 16 a mine; 20 mines, or 320 bushels, the muid. For plaster, 12 bushels make a sack, and 36 sacks a muid. For lime, three bushels make a minot, and 48 minots a muid. The minot is by ordonnance to be 11 inches 9 lines high, and 14 inches 8 lines in diameter. The minot is composed of three bushels, or 16 litrons; four minots make a septier, and 48 a muid. The French mine is no real vessel, but an estimation of several others. At Paris the mine contains six bushels, and 24 make the muid; at Rouen the mine is four bushels; and at Dieppe, 18 mines make a Paris muid. The septier differs in different places: at Paris it contains two mines, or eight bushels, and 12 septiers the

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muid. At Rouen the septier contains two mines or 12 bushels. Twelve septiers make a muid at Rouen as well as at Paris; but 12 of the latter are equal to 14 of the former. At Toulon the septier contains a mine and a half; three of which mines make the septier of Paris. The muid or muy of Paris consists of 12 septiers; and is divided into mines, minots, bushels, &c. That for oats is double that for other grain, i. e. contains twice the number of bushels. At Orleans the muid is divided into mines, but those mines only contain two Paris septiers and a half. In some places they use the tun in lieu of the muid; particularly at Nantes, where it contains 10 septiers of 16 bushels each, and weighs between 2200 and 2250 pounds. Three of these tuns make 28 Paris septiers. At Rochelle, &c. the tun contains 42 bushels, and weighs two per cent. less than that of Nantes. At Brest it contains 20 bushels, is equal to 10 Paris septiers, and weighs about 2240 pounds. See TUN.

4.] *Dutch, Swedish, Polish, Prussian, and Muscovite.* In these places, they estimate their dry things on the foot of the *last*, *left*, *leth*, or *lecht*; so called according to the various pronunciations of the people who use it. In Holland, the last is equal to 19 Paris septiers, or 38 Bourdeaux bushels, and weighs about 4560 pounds; the last they divide into 27 mudes, and the mude into four schepels. In Poland, the last is 40 Bourdeaux bushels, and weighs about 4800 Paris pounds. In Prussia, the last is 133 Paris septiers. In Sweden and Muscovy, they measure by the great and little last; the first containing 12 barrels, and the second half as many. See LAST. In Muscovy, they likewise use the chefford, which is different in various places: that of Archangel is equal to three Rouen bushels.

5.] *Italian.* At Venice, Leghorn, and Lucca, they estimate their dry things on the foot of the *staro* or *stajo*; the staro of Leghorn weighs 54 pounds: 112 staros and seven-eighths are equal to the Amsterdam last. At Lucca, 119 staros make the last of Amsterdam. The Venetian staro weighs 128 Paris pounds: the staro is divided into four quarters. Thirty-five staros and one-fifth, or 140 quarters and four-fifths, make the last of Amsterdam. At Naples and other parts, they use the tomolo or tomalo, equal to one-third of the Paris septier. Thirty-six tomoli and a half make the carro: and a carro and a half, or 54 tomoli, make the last of Amsterdam. At Palermo, 16 tomoli make the salma, and four mondili the tomolo. Ten salmas and three-sevenths, or 171 tomoli and three-sevenths, make the last of Amsterdam.

6.] *Flemish.* At Antwerp, &c. they measure by the viertel; 32 and one-half whereof make 19 Paris septiers. At Hamburgh, the schepel; 90 whereof make 19 Paris septiers.

7.] *Spanish and Portuguese.* At Cadiz, Bilboa, and St Sebastian, they use the fanega; 23 whereof make the Nantes or Rochelle tun, or nine Paris septiers and a half: though the Bilboa fanega is somewhat larger, inasmuch that 21 fanegas make a Nantes tun. At Seville, &c. they use the anagoras, containing a little more than the Paris mine; 36 anagoras make 19 Paris septiers. At Bayonne, &c. the concha; 30 whereof are equal to nine Paris septiers and an half. At Lisbon, the alquiver, a very small measure, 240 whereof make 19 Paris septiers, 60 the Lisbon muid.

TABLES of DRY Measure.

1. ENGLISH.

Solid inches				
33.6	Pint			
268.8	8	Gallon		
537.6	16	2	Peck	
2150.4	64	8	4	Bushel
17203.2	512	64	32	Quarter.

2. SCRIPTURE Dry, reduced to English.

					Peck.	Gal.	Pint.	Sol. inch.	Dec.
Gachal					0	0	0 $\frac{17}{120}$	0.031	
20 Cab					0	0	2 $\frac{1}{8}$	0.073	
36 $1\frac{4}{7}$ Gomor					0	0	5 $\frac{1}{10}$	1.211	
120 6 $3\frac{1}{7}$ Seah					1	0	1	4.036	
360 18 10 3 Ephah					3	0	3	12.107	
1800 90 50 15 5 Leteah					16	0	0	26.500	
3600 180 100 30 10 2 Chomer, or coron.					32	0	1	18.969	

3. ATTIC Measures of Capacity for Things dry, reduced to English Corn Measure.

						Peck.	Gal.	Pint.	Sol. inch.	Dec.
Cochliarion						0	0	0	0.276 $\frac{1}{10}$	
10 Cyathos						0	0	0	2.763 $\frac{1}{2}$	
15 $1\frac{1}{2}$ Oxybaphon						0	0	0	4.144 $\frac{1}{2}$	
60 6 4 Cotyle						0	0	0	16.579	
120 12 8 2 Xestes						0	0	0	33.158	
180 18 12 3 $1\frac{1}{2}$ Choenix						0	0	1	15.705 $\frac{1}{2}$	
8640 864 576 144 72 48 Medimnos						4	0	6	3.501	

4. ROMAN Measures of Capacity for Things dry, reduced to English Corn Measure.

						Peck.	Gal.	Pint.	Sol. inch.	Dec.
Ligula						0	0	0 $\frac{1}{48}$	0.01	
4 Cyathus						0	0	0 $\frac{1}{12}$	0.04	
6 $1\frac{1}{2}$ Acetabulum						0	0	0 $\frac{1}{8}$	0.06	
24 6 4 Hemina						0	0	8 $\frac{1}{2}$	0.24	
48 12 8 2 Sextarius						0	0	1	0.48	
384 96 64 16 8 Semimodius						0	1	0	3.84	
768 192 128 32 16 2 Modius						1	0	0	7.68	

Measure.

MEASURE of Wood for Firing, is usually the cord; four feet high, and as many broad, and eight long; this is divided into two half-cords, called *ways*, and by the French *membrures*, from the pieces stuck upright to bound them; or *voyes*, as being supposed half a waggon-load.

MEASURE for Horses, is the hand, which by statute contains four inches.

MEASURE, among botanists. In describing the parts of plants, Tournefort introduced a geometrical scale, which many of his followers have retained. They measured every part of the plant; and the essence of the description consisted in an accurate mensuration of the whole.

As the parts of plants, however, are liable to variation in no circumstance so much as that of dimension, Linnæus very rarely admits any other mensuration than that arising from the respective length and breadth of the parts compared together. In cases that require actual mensuration, the same author recommends, in lieu of Tournefort's artificial scale, the following natural scale of the human body, which he thinks is much more convenient, and equally accurate.

The scale in question consists of 11 degrees, which are as follows: 1. A hair's-breadth, or the diameter of a hair, (*capillus*.) 2. A line, (*linea*), the breadth of the crescent or white appearance at the root of the finger, (not thumb), measured from the skin towards the body of the nail; a line is equal to 12 hair-breadths, and is the 12th part of a Parisian inch. 3. A nail, (*unguis*), the length of a finger-nail; equal to six lines, or half a Parisian inch. 4. A thumb, (*pollex*), the length of the first or outermost joint of the thumb; equal to a Parisian inch. 5. A palm, (*palmus*), the breadth of the palm exclusive of the thumb; equal to three Parisian inches. 6. A span, (*spithama*), the distance between the extremity of the thumb and that of the first finger when extended; equal to seven Parisian inches. 7. A great span, (*dodrans*), the distance between the extremity of the thumb and that of the little finger, when extended; equal to nine inches. 8. A foot, (*pes*), measuring from the elbow to the basis of the thumb; equal to 12 Parisian inches. 9. A cubit, (*cubitus*), from the elbow to the extremity of the middle finger; equal to 17 inches. 10. An arm-length, (*brachium*), from the arm-pit to the extremity of the middle-finger; equal to 24 Parisian inches, or two feet. 11. A fathom, (*orgya*), the measure of the human stature; the distance between the extremities of the two middle fingers, when the arms are extended; equal, where greatest, to six feet.

MEASURE is also used to signify the cadence and time observed in poetry, dancing, and music, to render them regular and agreeable.

The different measures or metres in poetry, are the different manners of ordering and combining the quantities, or the long and short syllables. Thus, hexameter, pentameter, iambic, sapphic verses, &c. consist of different measures.

In English verses, the measures are extremely various and arbitrary, every poet being at liberty to introduce any new form that he pleases. The most usual are the heroic, generally consisting of five long and

five short syllables; and verses of four feet; and of three feet and a cæsure, or single syllable.

Measure, Measuring.

The ancients, by variously combining and transposing their quantities, made a vast variety of different measures. Of words, or rather feet of two syllables, they formed a spondee, consisting of two long syllables; a pyrrhic, of two short syllables; a trochee, of a long and a short syllable; and an iambic, of a short and a long syllable.

Of their feet of three syllables they formed a molossus, consisting of three long syllables; a tibrach, of three short syllables; a dactyl, of one long and two short syllables; and an anepæst, of two short and one long syllable. The Greek poets contrived 124 different combinations or measures, under as many different names, from feet of two syllables to those of six.

MEASURE in Music, the interval or space of time which the person who beats time, takes between the raising and falling of his hand or foot, in order to conduct the movement, sometimes quicker, and sometimes slower, according to the kind of music, or the subject that is sung or played.

The measure is that which regulates the time we are to dwell on each note. See TIME.

The ordinary or common measure is one second, or 60th part of a minute, which is nearly the space between the beats of the pulse or heart; the systole, or contraction of the heart, answering to the elevation of the hand; and its diastole, or dilatation, to the letting it fall. The measure usually takes up the space that a pendulum of two feet and an half long employs in making a swing or vibration. The measure is regulated according to the different quality or value of the notes in the piece; by which the time that each note is to take up is expressed. The semibreve, for instance, holds one rise, and one fall; and this is called the *measure*, or *whole measure*; sometimes the *measure-note*, or *time-note*; the minim, one rise, or one fall; and the crotchet, half a rise, or half a fall, there being four crotchets in a full measure.

MEASURE Binary or Double, is that wherein the rise and fall of the hand are equal.

MEASURE Ternary or Triple, is that wherein the fall is double to the rise; or where two minims are played during a fall, and but one in the rise. To this purpose, the number 3 is placed at the beginning of the lines, when the measure is intended to be triple; and a C, when the measure is to be common or double. This rising and falling of the hands was called by the Greeks *anagis* and *katagis*. St Augustine calls it *plausus*, and the Spaniards *compas*. See ARSIS and THESIS.

Powder MEASURES in Artillery, are made of copper, and contain from an ounce to 12 pounds: these are very convenient in a siege, when guns or mortars are loaded with loose powder, especially in ricochet firing, &c.

MEASURING, or MENSURATION, is the using a certain known measure, and determining thereby the precise extent, quantity, or capacity of any thing.

MEASURING, in the general, makes the practical part of geometry. From the various subjects whereon

Meat.

it is employed, it acquires various names, and constitutes various arts. See GEOMETRY, LEVELLING, TRIGONOMETRY, &c.

MEAT. See FOOD, DIET, DRINK, &c.

Amongst the Jews, several kinds of animals were forbidden to be used as food. The flesh with the blood, and the blood without the flesh, were prohibited; the fat also of sacrificed animals was not to be eaten. Roast meat, boiled meat, and ragouts, were in use amongst the Hebrews, but we meet with no kind of seasoning except salt, bitter herbs, and honey.—They never mingled milk in any ragout or hash, and never eat at the same meal both meat and milk, butter or cheese. The daily provision for Solomon's table was 30 measures of fine wheat flour, 60 of common flour, 20 stalls of oxen, 20 pasture oxen, 100 sheep, besides venison and wild-fowl. See LUXURY.

The principal and most necessary food among the ancient Greeks was bread, which they called *αἶστος*, and produced in a wicker basket called *κάνιστος*. Their loaves were sometimes baked under the ashes, and sometimes in an oven. They also used a sort of bread called *Maza*. Barley meal was used amongst the Greeks, which they called *αἶστος*. They had a frequent dish called *βρύση*, which was a composition of rice, cheese, eggs, and honey, wrapped in fig-leaves. The *Μυτταβίον* was made of cheese, garlic, and eggs, beaten and mixed together. Their bread, and other substitutes for bread, were baked in the form of hollow plates, into which they poured a sauce. Garlic, onions, and figs, seem to have been a very common food amongst the poorer Athenians. The Greeks, especially in the heroic times, ate flesh roasted; boiled meat seldom was used. Fish seems not to have been used for food in the early ages of Greece. The young people only, amongst the Lacedemonians, ate animal food; the men and the old men were supported by a black soup called *μυταβίον*, which to people of other nations was always a disagreeable mess. Grass-hoppers and the extremities or tender shoots of trees were frequently eaten by the poor among the Greeks. Eels dressed with beet root was esteemed a delicate dish, and they were fond of the jowl and belly of salt-fish. Neither were they without their sweet-meats: the desert consisted frequently of fruits, almonds, nuts, figs, peaches, &c. In every kind of food we find salt to have been used.

The diet of the first Romans consisted wholly of milk, herbs, and roots, which they cultivated and dressed with their own hands; they also had a kind of gruel, or coarse gross pap, composed of meal and boiling water; this served for bread: And when they began to use bread, they had none for a great while but of unmixed rye. Barley-meal was eaten by them, which they called *Polenta*. When they began to eat animal food, it was esteemed a piece of luxury, and an indulgence not to be justified but by some particular occasion. After animal food had grown into common use, the meat which they most frequently produced upon their tables was pork.

Method of Preserving Flesh-Meat without Spices, and with very little Salt. Jones, in his *Miscellanea Curiosa*, gives us the following description of the Moorish *Elcholle*, which is made of beef, mutton, or camel's flesh, but chiefly beef, and which they cut

all in long slices, and let it lie for 24 hours in a pickle. They then remove it out of those jars or tubs into others with water; and when it has lain a night, they take it out, and put it on ropes in the sun and air to dry. When it is thoroughly dried and hard, they cut it into pieces of two or three inches long, and throw it into a pan or caldron, which is ready with boiling oil and fuel sufficient to hold it, where it boils till it be very clear and red when cut. After this they take it out, and set it to drain; and when all is thus done it stands to cool, and jars are prepared to put it up in, pouring upon it the liquor in which it was fried; and as soon as it is thoroughly cold, they stop it up close. It will keep two years; will be hard, and the hardest they look upon to be the best done. This they dish up cold, sometimes fried with eggs and garlic, sometimes stewed, and lemon squeezed on it. It is very good any way, either hot or cold.

MEATH, commonly so called, or otherwise *East Meath*, to distinguish it from the county called *West Meath*: A county of Ireland, in the province of Leinster, bounded by the counties of Cavan and Louth on the north, the Irish channel on the east, Kildare and Dublin on the south, and West Meath and Longford on the west. It is a fine champaign country, abounding with corn, and well inhabited. It returns 14 members to parliament; and gives title of earl to the family of Brabazan. It contains 326,480 Irish plantation acres, 139 parishes, 12 baronies, and six boroughs; chief town Trim. This district being the most ancient settlement of the Belgians in Ireland, the inhabitants were esteemed the eldest and most honourable tribe: from which seniority their chieftains were elected monarchs of all the Belgæ; a dignity that was continued in the Hy-n-Faillian without intermission, until the arrival of the Caledonian colonies, under the name of Tuath de Danan, when Conor-Mor, chieftain of these people, obtained, or rather usurped, the monarchical throne, obliged Eochy Failloch, with several of his people, to cross the Shannon, and establish themselves in the present county of Roscommon, where Crothar founded the palace of Atha or Croghan, a circumstance which brought on a long and bloody war between the Belgian and Caledonian races, which was not finally terminated until the close of the 4th century, when the Belgian line was restored in the person of O'Nial the great, and continued until Brian Boromh usurped the monarchical dignity, by deposing Malachy O'Malachlin, about the year 1001. Tuathal Tetethomar, by a decree of the Tarah assembly, separated certain large tracts of land from each of the four provinces, where the borders joined together; whence, under the notion of adopting this spot for demesne lands to support the royal household, he formed the county or kingdom of Meath, which afterwards became the peculiar inheritance of the monarchs of Ireland. In each of the portions thus separated from the four provinces, Tuathal caused palaces to be erected, which might adorn them, and commemorate the name in which they had been added to the royal domain. In the track taken out of Munster, he built the palace called Flachtaga, where the sacred fire, so called, was kindled, and where all the priests and druids annually met on the last day of October; on the evening of which day it was enacted, that no other fire should

Meath.

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Meath

be used throughout the kingdom, in order that all the fires might be derived from this, which being lighted up as a fire of sacrifice, their superstition led them to believe would render all the rest propitious and holy; and for this privilege every family was to pay three-pence, by way of acknowledgment to the king of Munster. The second royal palace was erected in the proportion taken out of Connaught, and was built for the assembly called the convocation of Visneach, at which all the inhabitants were summoned to appear on the 1st day of May, to offer sacrifice to *Beal*, or *Bel*, the god of fire, in whose honour two large fires being kindled, the natives used to drive their cattle between them, which was supposed to be a preservative for them against accidents and distempers, and this was called *Beal-Tinne*, or *Bel-Tine*, or the festival of the god of fire. The king of Connaught at this meeting claimed a horse and arms from every lord of a manor or chieftain, as an acknowledgement for the lands taken from that province, to add to the territory of Meath. The third was that which Tailtean erected in the part taken from Ulster, where the fair of that name was held, which was remarkable for this particular circumstance, that the inhabitants brought their children thither, males and females, and contracted them in marriage, where the parents having agreed upon articles, the young people were joined accordingly; every couple contracted at this meeting, paid the king of Ulster an ounce of silver by way of acknowledgment. The royal mansion of Tarah, formerly destroyed by fire, being re-built by Tuathal, on the lands originally belonging to the king of Leinster, was reckoned as the fourth of these palaces; but as a fabric of that name had stood there before, we do not find that any acknowledgment was made for it to the king of Leinster.

Meath, with *Clonmacnois*, is a bishop's see, valued in the king's books at L. 373 : 7 : 0½; Sterling, by an extent returned anno 28th Elizabeth; but, by a former extent taken anno 30th Henry VIII. the valuation amounts to L. 373, 12 s. which being the largest and most profitable for the king, is the measure of the first fruits at this day. This see is reputed to be worth annually L. 3400. There were formerly many Episcopal sees in Meath, as Clonard, Duleek, Kells, Trim, Ardbraccan, Donshaghlin, Slaine, and Foure, besides others of less note; all these, except Duleek and Kells, were consolidated, and their common see was fixed at Clonard, before the year 1152; at which time the divisions of the bishoprics in Ireland was made by John Paparo, cardinal-priest, entitled cardinal of St Lawrence in Damaso, then legate from Pope Eugene III. to the Irish. This division was made in a Synod held on the 6th of March in the abbey of Mellifont, or, as some say, at Kells; and the two sees of Duleek and Kells afterwards submitted to the same fate. The constitution of this diocese is singular, having no dean nor chapter, cathedral, or economy.—Under the bishop, the archdeacon is the head officer, to whom, and to the clergy in general, the *congé d'elire* issued while bishops were elective. The affairs of the diocese are transacted by a synod, in the nature of a chapter, who have a common seal, which is annually lodged in the hands of one of the body, by the ap-

pointment and vote of the majority. The diocese is divided into twelve rural deaneries.

Of CLONMACNOIS, now annexed to Meath: There is no valuation of this see in the king's books; but it is supposed to be included in the extent of the see of Meath, taken anno 30th Henry VIII. The chapter of this see consisted anciently of dean, chanter, chancellor, treasurer, archdeacon, and twelve prebendaries, but most of the possessions of them have fallen into lay-hands. At present the deanery is the only part of the chapter which subsists, to which the prebend of Cloghran is annexed, and he hath a seal of office, which appears to have been the ancient Episcopal seal of this see. This see was founded by St Kiaran, or Ciaran, the younger, in 543 or 549; and Dermot, the son of Ceronill, king of Ireland, granted the site on which the church was built.

West MEATH. See WESTMEATH.

MEATUS AUDITORIUS. See ANATOMY, n° 139.

MEAUX, an ancient town of France, in Brie, with a bishop's see, seated in a place abounding in corn and cattle, on the river Marne, which divides it into two parts, and its trade consists in corn, wool, and cheese. E. Long. 2. 58. N. Lat. 48. 58.

MECÆNAS, or MECENAS (C. Cilnius), a celebrated Roman knight, descended from the kings of Etruria. He has rendered himself immortal by his liberal patronage of learned men and of letters; and to his prudence and advice Augustus acknowledged himself indebted for the security he enjoyed. His fondness for pleasure removed him from the reach of ambition; and he preferred dying, as he was born, a Roman knight, to all the honours and dignities which either the friendship of Augustus or his own popularity could heap upon him. To the interference of Mæcenas, Virgil owed the retribution of his lands; and Horace was proud to boast that his learned friend had obtained his forgiveness from the emperor, for joining the cause of Brutus at the battle of Philippi. Mæcenas was himself fond of literature; and, according to the most received opinion, he wrote a history of animals, a journal of the life of Augustus, a treatise on the different natures and kinds of precious stones, besides the two tragedies of Octavia and Prometheus, and other things, all now lost. He died eight years before Christ; and on his death-bed he particularly recommended his poetical friend Horace to the care and confidence of Augustus. Seneca, who has liberally commended the genius and abilities of Mæcenas, has not withheld his censure from his dissipation, indolence, and effeminate luxury. From the patronage and encouragement which the princes of heroic and lyric poetry among the Latins received from the favourite of Augustus, all patrons of literature have ever since been called *Mæcenas*. Virgil dedicated to him his Georgics, and Horace his odes.

MECCA, an ancient and very famous town of Asia, in Arabia the Happy; seated on a barren spot, in a valley surrounded with little hills, about a day's journey from the Red-Sea. It is a place of no strength, having neither walls nor gates, and the buildings are very mean. That which supports it is the resort of a great many thousand pilgrims annually, for the shops are scarcely open all the year besides. The inhabitants

Meath

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Mecca.

Mecca.

are poor, very thin, lean, and swarthy. The hills about the town are very numerous; and consist of a blackish rock, some of them half a mile in circumference. On the top of one of them is a cave, where they pretend Mahomet usually retired to perform his devotions, and hither they affirm the greatest part of the Alcoran was brought him by the angel Gabriel. The town has plenty of water, and yet little garden-stuff; but there are several sorts of good fruits to be had, such as grapes, melons, water-melons, and cucumbers. There are also plenty of sheep brought thither to be sold to the pilgrims. It stands in a very hot climate; and the inhabitants usually sleep on the tops of their houses for the sake of coolness. In order to protect themselves from the heat through the day, they carefully shut the windows, and water the streets to refresh the air. There have been instances of persons suffocated in the middle of the town by the burning wind called *Simoom*.

As a great number of the people of distinction in the province of Hedsjas stay in the city, it is better built than any other in Arabia. Amongst the beautiful edifices it contains, the most remarkable is the famous *Kaba*, or *Caaba*, "The house of God," which was held in great veneration by the Arabs even before Mahomet's time.

No Christian dare go to Mecca; not that the approach to it is prohibited by any express law, or that the sensible part of the Mahometans have any thing to object to it; but on account of the prejudices of the people, who, regarding this ground as sacred, think Christians unworthy of setting their foot on it; it would be profaned, in the opinion of the superstitious, if it was trod upon by infidels. The people even believe, that Christians are prevented from approaching by some supernatural power; and they tell the story of an infidel, who having got so far as the hills that surround Mecca, all the dogs of the city came out, and fell upon him; and who, being struck with this miracle, and the august appearance of the *Kaba*, immediately became a mussulman. It is therefore to be presumed, that all the Europeans who describe Mecca as eye-witnesses, have been renegadoes escaped from Turkey. A recent example confirms this supposition. On the promise of being allowed to preserve his religion, a French surgeon was prevailed on to accompany the Emir Hadsji to Mecca, in quality of physician; but at the very first station, he was forced to submit to circumcision, and then he was permitted to continue his journey.

Although the Mahometans do not allow Europeans to go to Mecca, they do not refuse to give them descriptions of the *Kaba*, and information with regard to that building; and there are persons who gain their bread by making designs and little pictures of the *Kaba*, and selling them to pilgrims. See *CAABA*.

The Mahometans have so high an opinion of the sanctity of Mecca, that they extend it to the places in the neighbourhood. The territory of that city is held sacred to certain distances, which are indicated by particular marks. Every caravan finds in its road a similar mark, which gives notice to the pilgrims when they are to put on the modest garb in which they must appear in those sacred regions. Every mussulman is obliged to go once in his life, at least, to Mecca, to

perform his devotions there. If that law was rigorously enforced, the concourse of pilgrims would be prodigious, and the city would never be able to contain the multitudes from all the countries where the Mahometan religion prevails. We must, therefore, suppose, that devotees alone perform this duty, and that the others can easily dispense with it. Those whose circumstances do not permit a long absence, have the liberty of going to Mecca by a substitute.—A hired pilgrim, however, cannot go for more than one person at a time; and he must, to prevent frauds, bring an attestation in proper form, from an Imam of Mecca, that he has performed the requisite devotions on behalf of such a person, either alive or dead; for, after the decease of a person who has not obeyed the law during his life, he is still obliged to perform the journey by proxy.

The caravans, which are not numerous, when we consider the immense multitude of the faithful, are composed of many people who do not make the journey from purposes of devotion. These are merchants, who think they can transport their merchandizes with more safety, and dispose of them more easily; and contractors of every kind, who furnish the pilgrims, and the soldiers who escort the caravans, with necessities. Thus it happens, that many people have gone often to Mecca, solely from views of interest. The most considerable of those caravans is that of Syria, commanded by the Pacha of Damascus. It joins at some distance the second from Egypt, which is conducted by a Bey, who takes the title of Emir Hadsji. One comes from Yemen, and another, less numerous, from the country of Lachsa. Some scattered pilgrims arrive by the Red Sea from the Indies, and from the Arabian establishments on the coasts of Africa. The Persians come in that which departs from Bagdad; the place of conductor to this last is bestowed by the Pacha, and is very lucrative, for he receives the ransoms of the heretical Persians.

It is of consequence to a pilgrim to arrive early at the holy places. Without having been present from the beginning at all the ceremonies, and without having performed every particular act of devotion, a man cannot acquire the title of Hadsji: this is an honour very much coveted by the Turks, for it confers real advantages, and makes those who attain it to be much respected. Its infrequency, however, in the Mahometan dominions, shows how much the observation of the law commanding pilgrimages is neglected. A similar custom prevails among the Oriental Christians, who are also exceedingly emulous of the title of Hadsji, or Mokdafi, which is given to pilgrims of their communion. In order to acquire this title, it is not sufficient that the person has made the journey to Jerusalem; he must also have kept the passover in that city, and have assisted at all the ceremonies of the holy weeks.

After all the essential ceremonies are over, the pilgrims next morning move to a place where they say Abraham went to offer up his son Isaac, which is about two or three miles from Mecca: here they pitch their tents, and then throw seven small stones against a little square stone building. This, as they affirm, is performed in defiance of the devil. Every one then purchases a sheep, which is brought for that purpose, eating

Mecca.

Mecca,
Mechanics

eating some of it themselves, and giving the rest to the poor people who attend upon that occasion. Indeed these are miserable objects, and such starved creatures, that they seem ready to devour each other. After all, one would imagine that this was a very sanctified place; and yet a renegado who went in pilgrimage thither, affirms there is as much debauchery practised here as in any part of the Turkish dominions. It is 25 miles from Jodda, the sea-port town of Mecca, and 220 south-east of Medina. E. Long. 40. 55. N. Lat. 21. 45.

MECHANICAL, an epithet applied to whatever relates to mechanics: thus we say, mechanical powers, causes, &c. See the articles POWER, CAUSE, &c.

The mechanical philosophy is the same with what is otherwise called *corpuscular philosophy*. See CORPUSCULAR.

This manner of reasoning is much used in medicine; and, according to Dr Quincy, is the result of a thorough acquaintance with the structure of animal bodies: for considering an animal body as a composition out of the same manner from which all other bodies are formed, and to have all those properties which concern a physician's regard, only by virtue of its peculiar construction; it naturally leads a person to consider the several parts, according to their figures, contexture,

and use, either as wheels, pulleys, wedges, levers, screws, cords, canals, strainers, &c. For which purpose, continues he, it is frequently found helpful to design in diagrams, whatsoever of that kind is under consideration, as is customary in geometrical demonstrations.

For the application of this doctrine to the human body, see the article MEDICINE.

MECHANICAL, in mathematics, denotes a construction of some problem, by the assistance of instruments, as the duplicature of the cube and quadrature of the circle, in contradistinction to that which is done in an accurate and geometrical manner.

MECHANICAL CURVE, is a curve, according to Descartes, which cannot be defined by any algebraic equation; and so stands contradistinguished from algebraic or geometrical curves.

Leibnitz and others call these mechanical curves *transcendental*, and dissent from Descartes, in excluding them out of geometry. Leibnitz found a new kind of transcendental equations, whereby these curves are defined: but they do not continue constantly the same in all points of the curve, as algebraic ones do. See the article TRANSCENDENTAL.

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M E C H A N I C S,

IN the strict sense of the word, denotes the method of constructing machines to be set in motion, and to answer some useful purposes, by certain powers, either natural or artificial. According to this definition, the nature of the powers themselves is not the object of mechanical investigation, but rather the effect of them upon the passive bodies which we call *machines*; and the constructing of these in such a manner, that the powers may act upon them with the least possible obstruction, and produce the intended effect to the greatest advantage, is the perfection of MECHANICS.

It is usual, in treatises upon this subject, to begin with an investigation of the properties of *matter* itself, and of *central forces*; but the former is not to be investigated by mechanical means; and the latter belongs so much to astronomy, that very little needs to be said upon them in this place; for which reason we refer to the articles ASTRONOMY, MATTER, and MOTION, for a discussion of these subjects. In treating of mechanics, therefore, we shall begin with a description of what are commonly called the *mechanic powers*; and afterwards consider the various ways in which they may be modified, in order to produce the effects expected from them.

SECT. I. Of Material or Mechanical Power in general.

§ 1. Production of Motion and Rest.

IN mechanics every thing is called a power which is capable of acting upon a solid body; and every power which can act upon matter is supposed to be material, without regarding any abstruse speculations concern-

ing its nature. Hence the force of gravity, of electricity, of fire, of air, of water, the power of animals, of bodies pressing or impinging with violence upon one another, are all accounted mechanical powers when applied to set machines in motion.

As any single power, when applied to a material body, will set it in motion in proportion to its quantity, so the action of an opposite power upon the same body produces rest. This may be easily conceived; for supposing two men to pull a log of wood with equal degrees of strength in directions exactly opposite to one another, the log will remain immoveable. In like manner, if we put in a weight into one scale of a balance, motion will be produced; but rest is the certain consequence of counterpoising it with an equal weight in the opposite scale. When a weight is suspended freely in the air, we are apt to imagine that it is acted upon by no force whatever; but we will soon discover our mistake, by withdrawing the pressure of the air from one side; for the body then, instead of remaining at rest, will move with great violence to one side, and even contrary to the direction of gravity itself, unless it be extremely heavy. Whether rest be in all cases produced by the action of opposite powers upon the same substance, is a speculation to be discussed under the article MOTION.

Rest produ-
ced by the
action of
two oppo-
site powers.

§ 2. Of Resistance.

WHEN any moving power is stopped by a fixed obstacle, so that it can proceed no farther, we say that it is *resisted* by that obstacle. In this case we are apt to imagine that there is no force exerted by the resisting obstacle; but it is found by experience, that resistance is to all intents and purposes equivalent to a

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Mechanical
Power

power equal and contrary to that which is impelled against the resisting obstacle. This is exemplified in the case of a man standing in a boat, and pushing with a pole against the bank of a river or lake. In this case every one knows that the boat will go off in a direction contrary to that in which he pushes; but if the boat be fastened by means of a hook and rope to that part of the pole which is between the man's body and the bank, the boat will remain immoveable by reason of the equality betwixt the action of the man upon the pole forward, and of the boat upon the same pole backward. Thus, in fig. 1. when the man pushes with the pole C against the bank D, in the direction CA, the boat B will be carried away from the bank in the direction AC; but if, by means of the rope E, the boat be fastened to the pole AC, the recoil of the boat in the direction AC will be just equal to the push given by the man in the direction CA, so that no motion will ensue let him exert ever so much strength. Hence we see, that by means of a resisting obstacle a power may be made to counteract itself, so that a motion or tendency to it may be produced in any direction; and in this case, as well as in the former, rest is produced by the opposition of two contrary forces.

The very same effect would follow, though we should suppose the man in the boat not to push against the bank or any fixed obstacle, but against another boat fastened by means of a rope to his own. In this case both the boats will recede from each other till the rope be stretched; after which they will both remain immoveable, unless they be acted upon by some power external to both. If both boats be at liberty, they will mutually recede from each other till they get beyond the reach of the pole.

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Resistance
equivalent
to an oppo-
sing power.

Resistance, whatever we may speculate about it, seems ultimately to depend on the power of gravity joined with that of cohesion. Thus a weight of 100 pounds, even when suspended in the freest manner we can imagine, will resist much more than 20 pounds suspended in the same manner; and though hard bodies resist to a great degree, yet unless connected with some very heavy body, they are easily moved out of their place; and the immense gravitation of the whole globe of earth, we may justly suppose to be the source of all resistance whatever to mechanical powers.

On the whole, therefore, we may consider resistance as an active power; but the action of which is confined to a very limited space, or to the single point of contact; though several experiments tend to show, that even before actual contact bodies show a very perceptible degree of resistance.

§ 3. Of the Communication of Power.

This depends entirely upon that property of bodies which is called their *attraction of cohesion*, and the immobility of their particles among themselves; for if the parts of a body are absolutely moveable among themselves, they can neither communicate motion by impulse nor by pressure. The most common method of communicating motion in the mechanical way is by pressure, which is generally accomplished by means of the six mechanical powers to be afterwards described: collision being employed only in certain particular

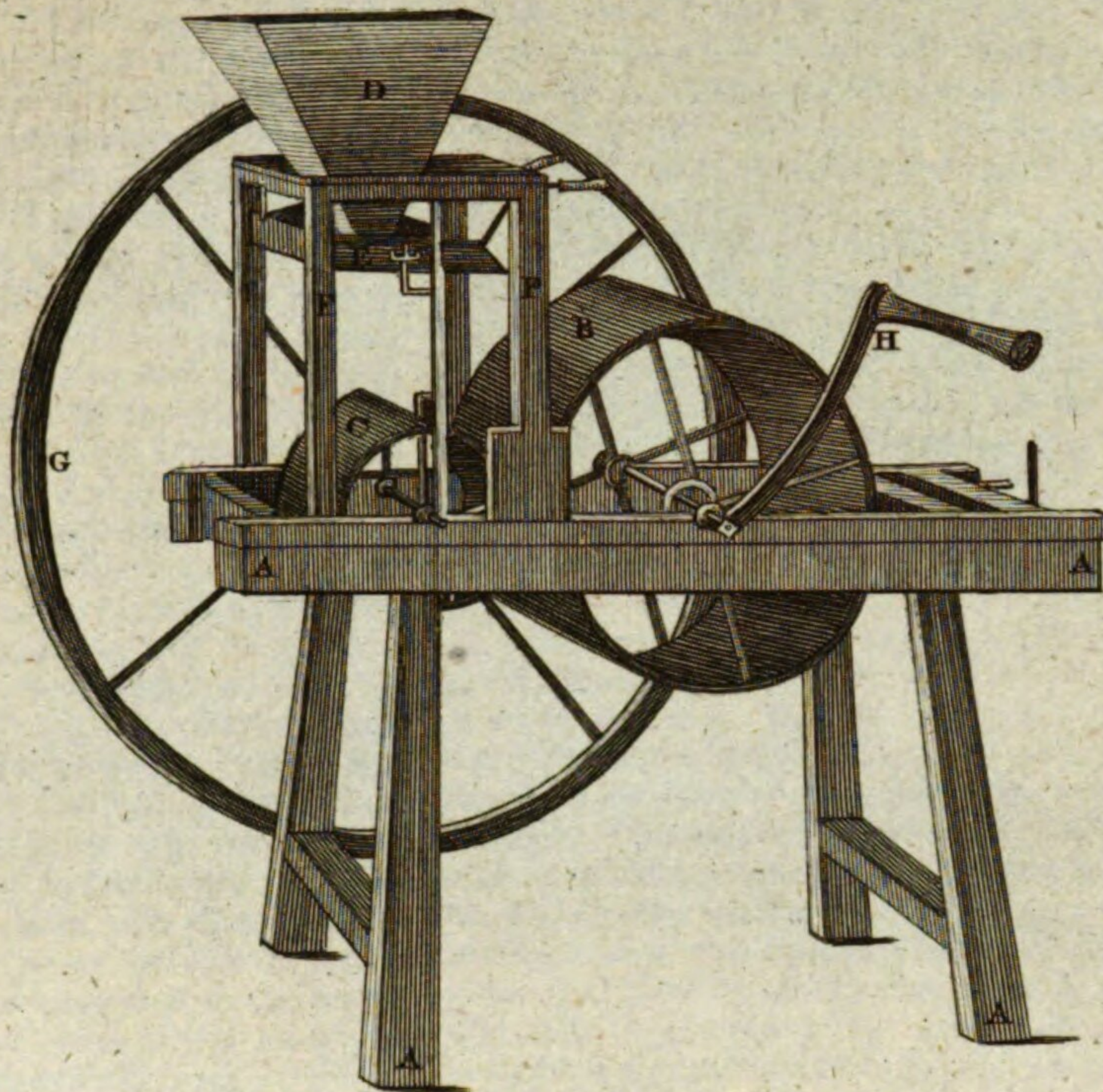
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cases, the most remarkable of which will be pointed out under the article MOTION.

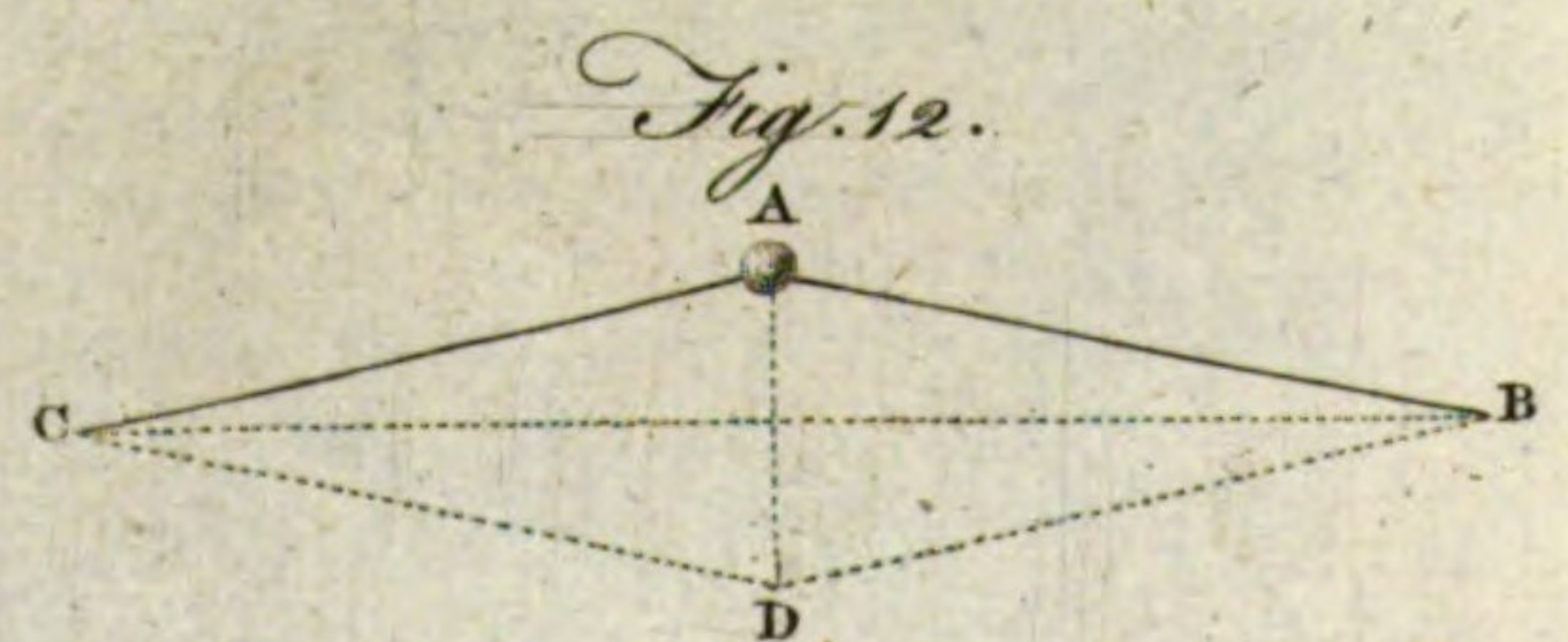
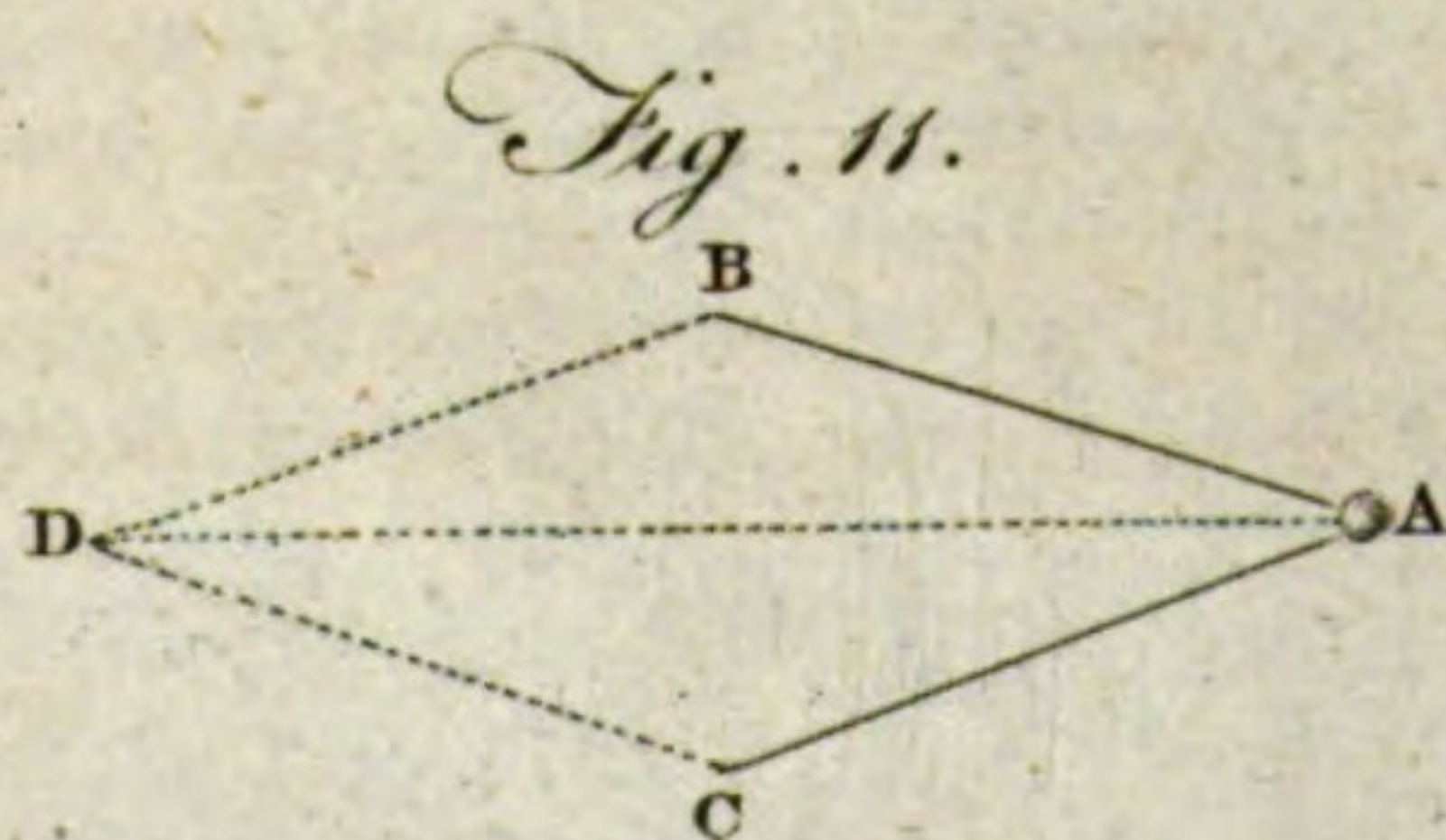
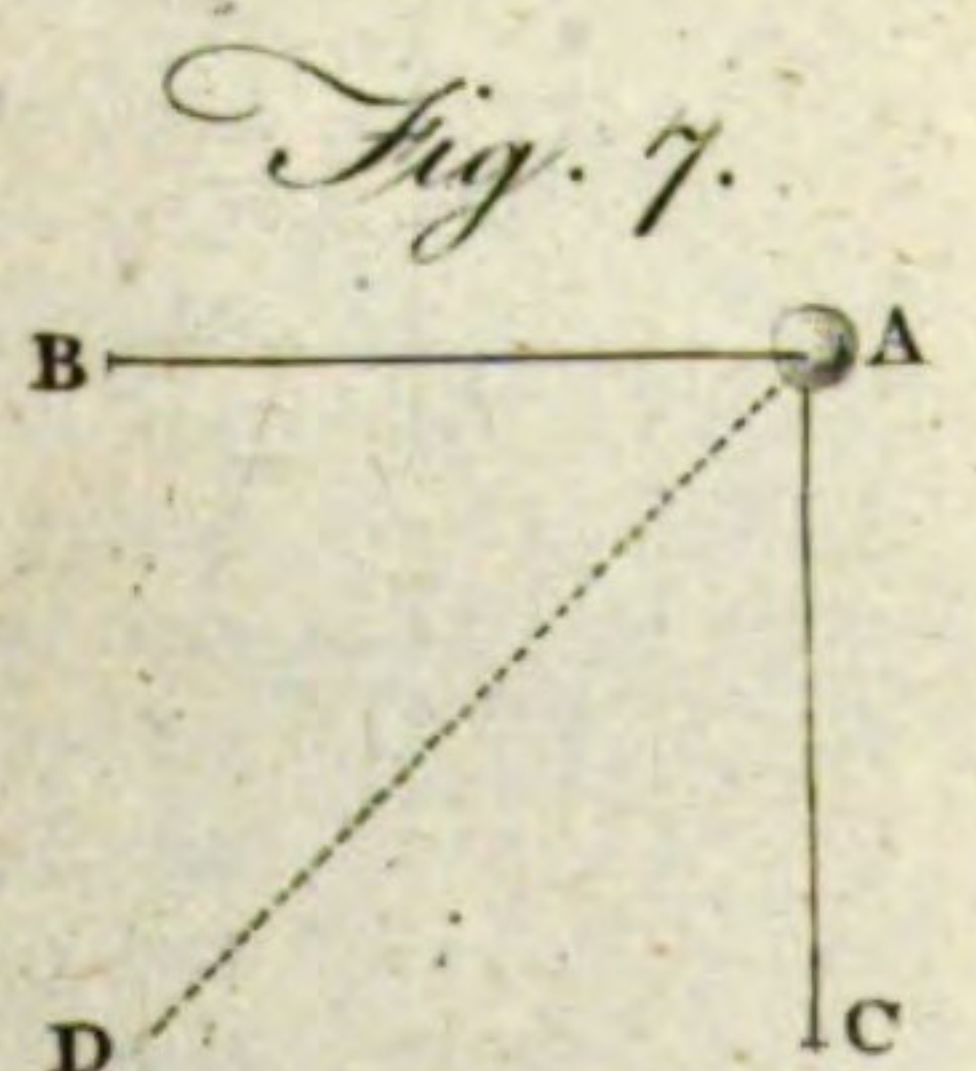
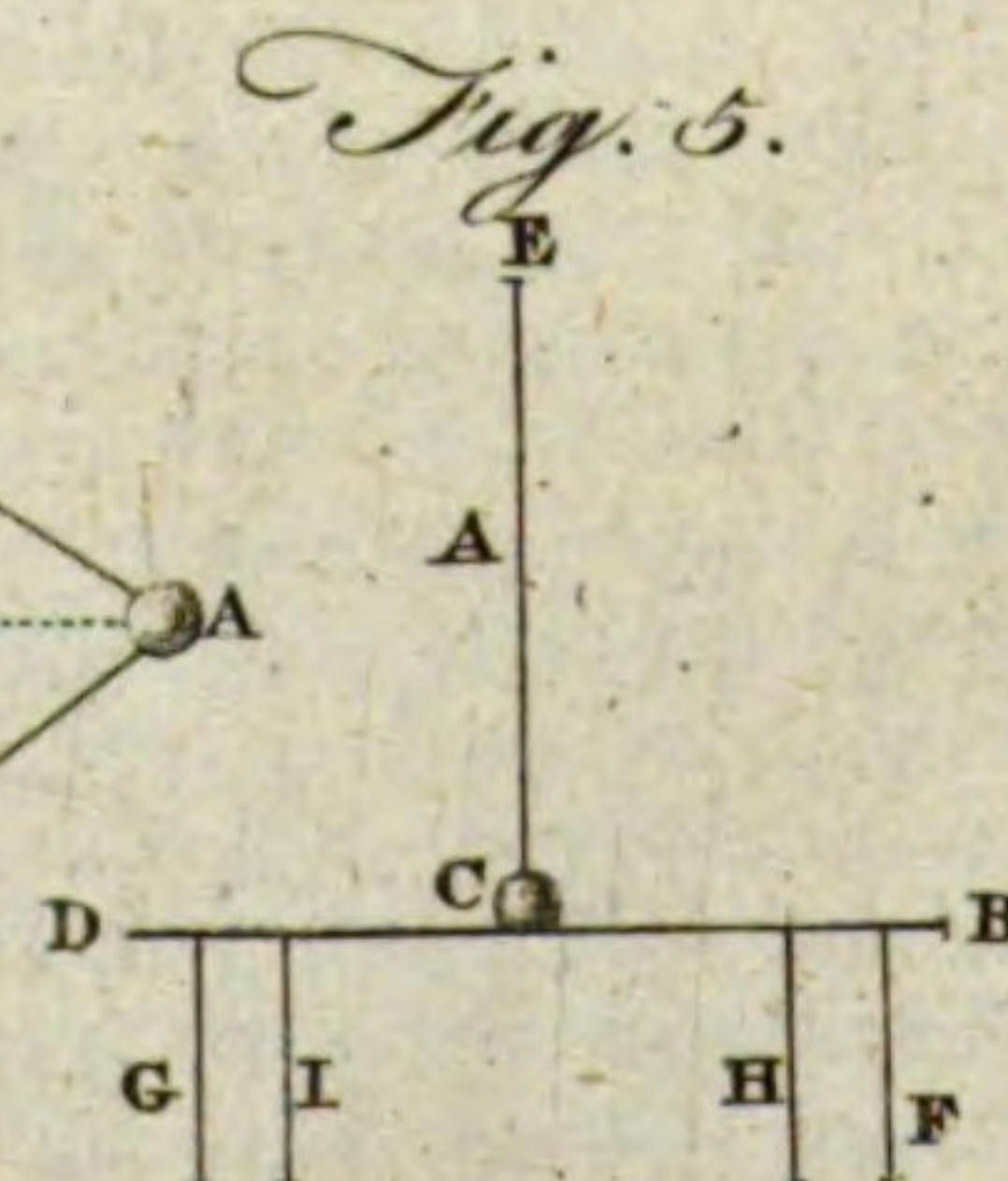
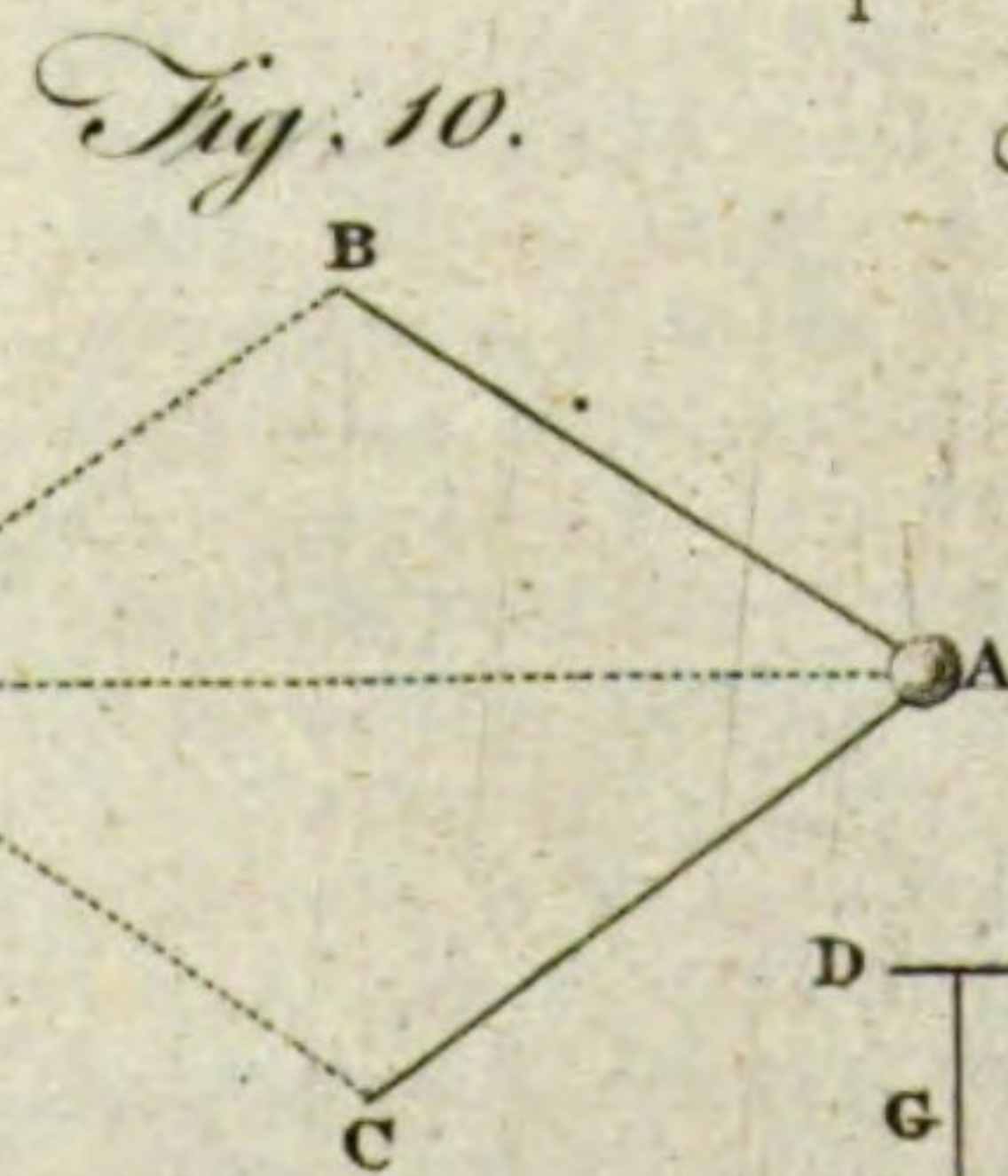
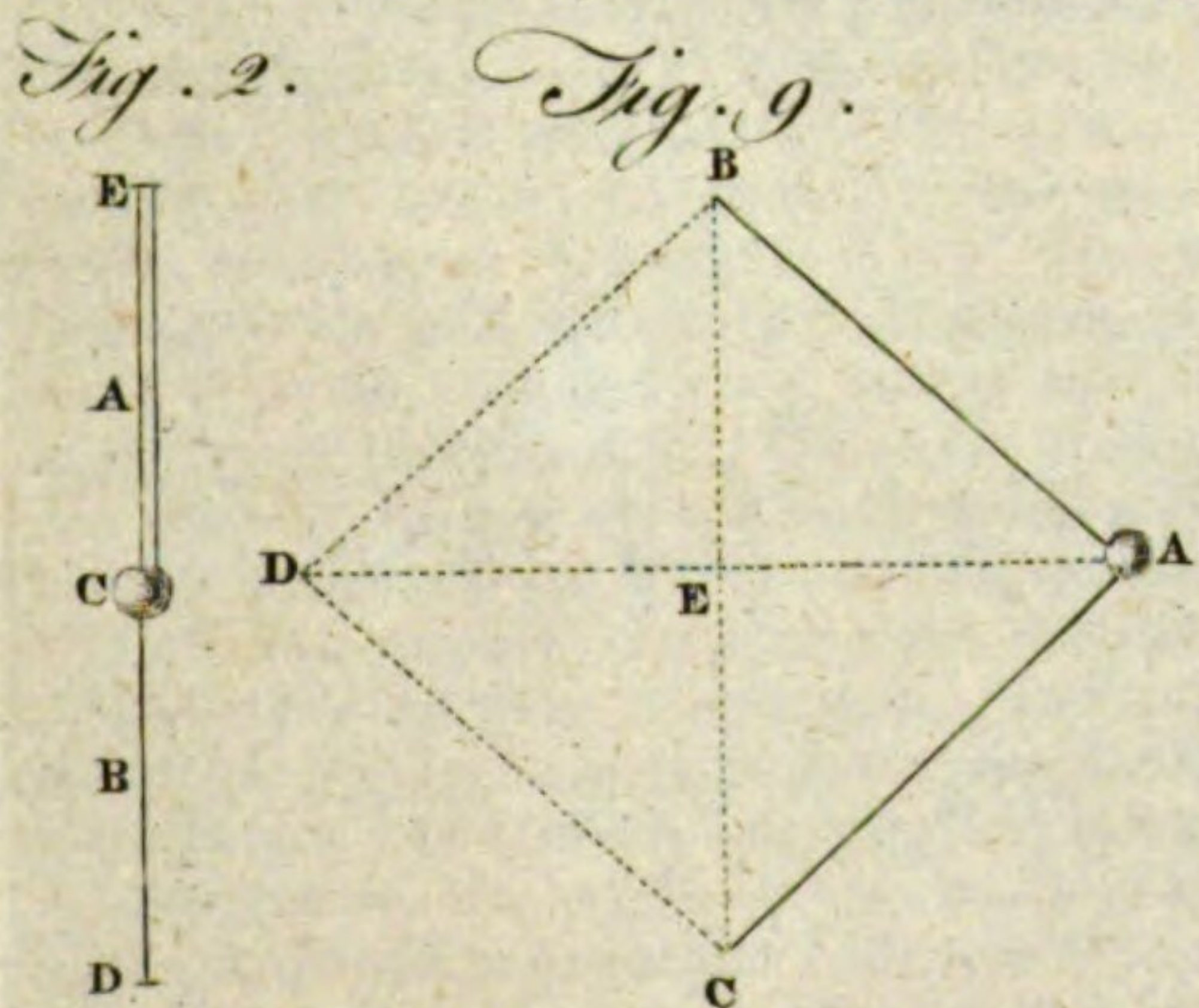
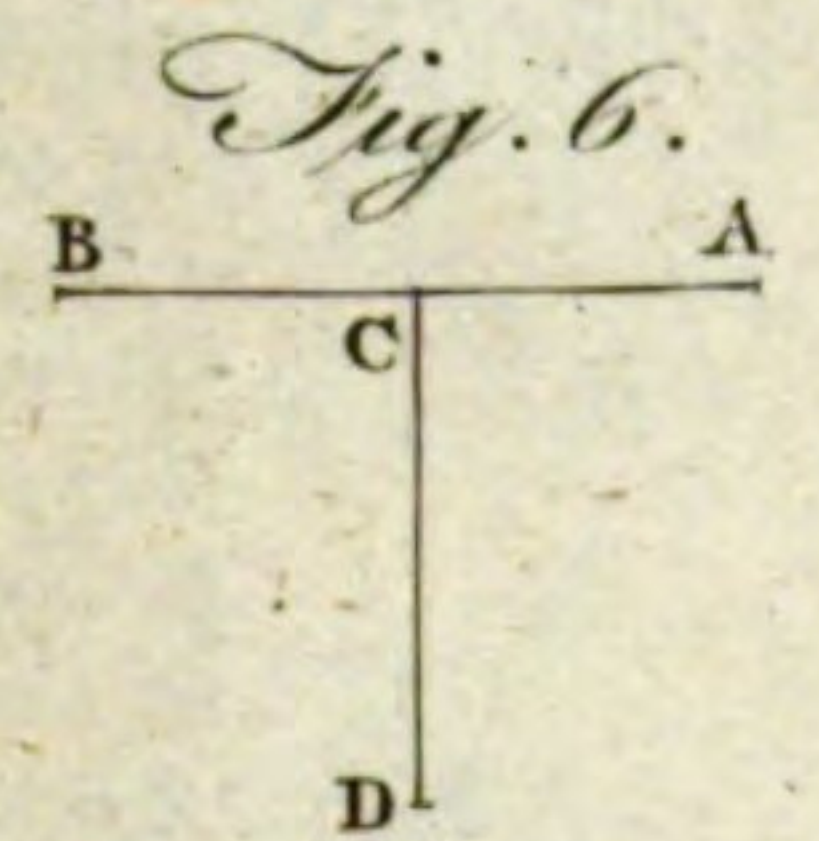
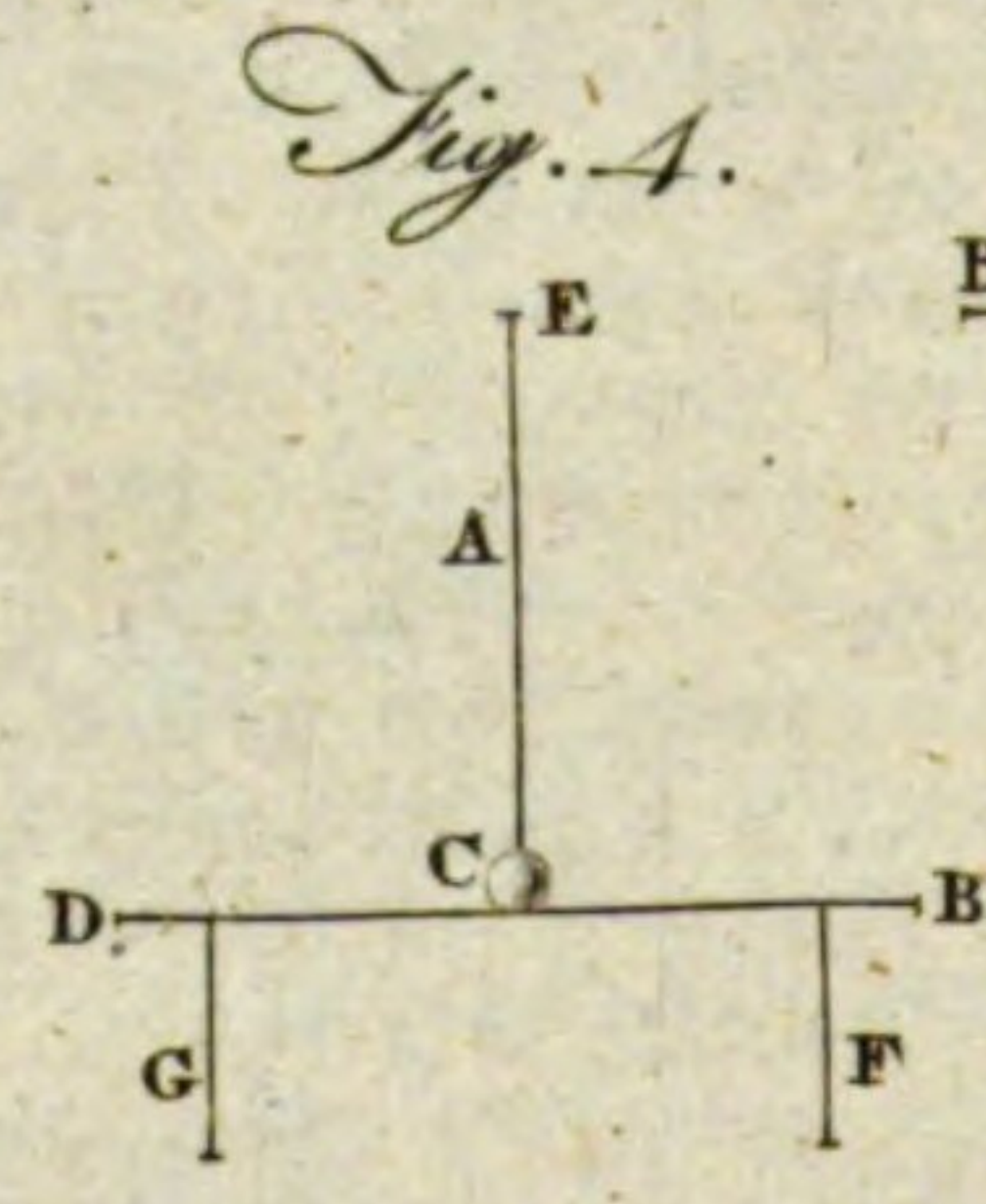
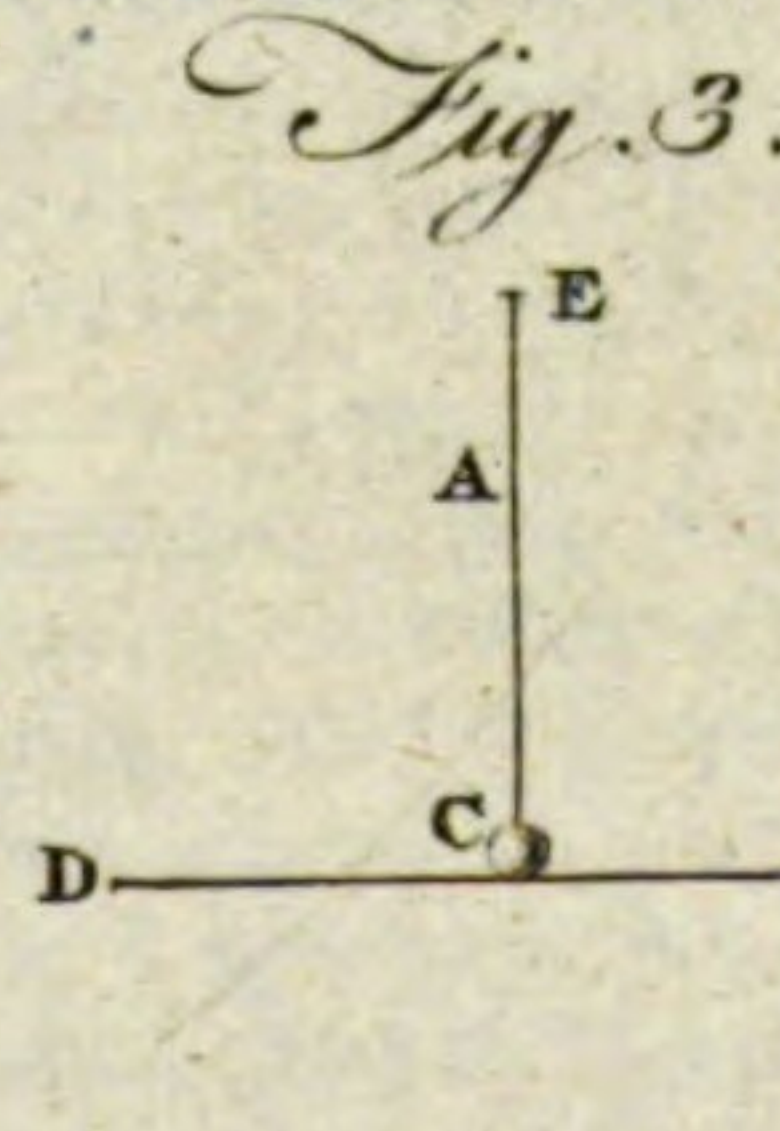
The motion, which by means of an hard inflexible body is communicated to any other, may be confined to a single point, or it may be diffused over any assignable space. Thus, in fig. 2. let us suppose that any assignable power is applied to the point E, urging it from E towards D; the whole of that force will rest upon the point of contact betwixt the ball C and the line BD. The weight, if placed exactly perpendicular to the horizon, will remain upright, without inclining either to one side or other; for the power of resistance in the line BD is exactly equal to the impulse of the weight lying upon E; so that it is in the same situation with the man and boat in the first example, when he had the boat hooked to the pole with which he pushed against the bank. If instead of opposing the end of the resisting body BD to the ball C, we place them in the position represented in fig. 3. then the whole of the power will rest upon any point of the line BD we please. For if we suppose the line EC to drive the line BD before it in the position represented in the figure, it is plain that the whole force of that line will be discharged for a moment upon the line F, or upon any obstacle we choose to put in its way in another part of the line; but if we place two supports or resistances to the moving line BD, as F and G in fig. 4. it is equally plain, that one half of the power will rest upon the one and one half upon the other. For the whole force urging forward the line BD is but a certain and determined quantity; and if divided betwixt two obstacles, each of these must undoubtedly bear one half. In like manner, if, as in fig. 5. the power be opposed by four obstacles, each of them will bear only one-fourth part; and so on if we suppose it opposed by ever so many. For reasons afterwards to be assigned, however, it is absolutely necessary that the force on E act in a line directly perpendicular upon BD; that the obstacles be all at equal distances, comparatively speaking, from C; as H and I, F and G, &c. likewise that they be of exactly the same height; for thus only the pressure, and consequently the motion, can be made uniform in all parts. On this principle depends in a great measure the perfection of printing presses, oil presses, and all other machines intended to produce a violent and uniform pressure upon any broad and flat surface.

As the pressure upon a single point may thus be diffused over a broad surface, so may that upon a broad surface be concentrated upon a single point or a surface of small dimension, as in fig. 6. Here it is plain that whatever pressure is applied to the line AB, or any part of it in a perpendicular direction, must be sustained by the point D; for if there was no resistance, this point would be driven along with the line AB, and the moment it was stopped the power which urged it on must likewise be stopped. It is true, that unless the power act directly perpendicular to the point D, or the line CD be supported that it cannot move either to one side or to another, the impulse will be but momentary; but of this we shall treat at large in the subsequent part of this article. On the principle just mentioned depends in a great degree the force of gimlets, augers, boring gimlets, &c.

§ 2. Of



MECHANICS.



§ 4. *Of changing the Direction of a Power into one directly opposite.*

THIS in all cases is only to be accomplished by the application of a power greater than that of which we wish to change the direction. Thus, in fig. 2. suppose we wish to change the direction of the power at E from the direction AC to that of CA, we will find it impossible to do so by any other means than the application of a greater power from D towards C. If the two powers are equal, there will be no motion whatever; and the degree of motion produced at last will only be the difference betwixt the two powers. If it be wanted therefore to produce a power in the direction CA, equal and opposite to that in the direction AC, one must be applied in the direction CA double to the former. This principle is different from that first mentioned, in which motion is produced by pushing against a fixed obstacle while the moving power is not resisted on the opposite side; for here the power of gravity, or whatever we suppose to act upon E, resists according to its quantity, and the whole is in the situation of the boat when hooked to the pole fig. 1. To produce motion, therefore, a new force must be applied, as if a person was to push from the bank D against the hooked pole of the boat in that figure. The principle just now laid down does not militate against the apparent *ascent* of bodies by the action of gravity, or the repulsion of elastic balls from one another by what is called the *power* of elasticity. In both cases a greater power is applied than the simple force of gravity, and with the excess of this power the body ascends, as shall be afterwards shown.

§ 5. *Of the Motion produced by two or more Powers acting upon a Body in directions oblique to each other.*

As the action of two powers in direct opposition to each other is attended with the destruction of both if the powers are equal, and of one of them if they are unequal; so the action of powers directed obliquely upon one another is productive of motions in various directions, according to that of the acting powers.

The motion produced by the action of two powers is always in the diagonal of the parallelogram expressed by these powers. Thus, in fig. 7. let the body A be acted upon at once by two forces, one of which would carry it from A to B in the same time that the other would carry it from A to C. The body will then describe AD, the diagonal of a square, in the time that it would have described one of the sides by a single power applied to it. This is in consequence of its obeying both forces; as it is evident that it has moved as far as from A to B, and likewise from A to C, which is precisely the effect that the two powers would have had upon it separately. In this case the body has acquired a greater power than it would have had from a single power, but less than it would have acquired from the union of the two powers if they had acted directly in concert with each other; because the diagonal of a square is less than the sum of the sides, and the power with which any body moves is exactly proportioned to its velocity. If, instead of supposing the forces equal, we suppose one of them considerably greater than the other, then the greater force

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will carry the body farther in its own direction than the other, and the whole will be represented by a parallelogram, as in fig. 8. In this case it is evident that the body has moved exactly in conformity to the direction of both powers, viz. the whole length of AB, and the whole length of AC. In this case also the loss of motion is less than in the former; because the length of the oblong parallelogram approaches much nearer to the sum of the sides than the diagonal of a square; and the greater inequality there is betwixt the sides, the less power is lost.

If, instead of acting at right angles to each other, the direction of the powers forms an acute angle, as in figs. 9, 10, 11, the power produced will be considerably greater than either of the original ones; and the more acute the angle is, the greater will be the augmentation, as is evident from an inspection of the figures. The reason of this, though not quite so obvious, is the same with the former. Thus the body A in fig. 9. had it been acted upon by only one power, viz. that denoted by AB, would have been at B, or carried as far forward as E, the half of the diagonal; its oblique direction upward not being taken into the account. Had it been acted upon by the force AC alone, it would have been at C with an obliquity as far down as the other is up. As these obliquities, however, are in contrary directions, they must of necessity destroy one another; and therefore the body moves neither to one side nor another, but proceeds with the sum of the direct forces of the powers, or those by which they move in the straight diagonal. But either of the two powers would have brought it forward as far as E; of consequence both conjoined must carry it on to D, the whole length of the diagonal. Thus it appears, that when a body is acted upon by two powers which partly conspire together, the power produced will be the exact sum of them as far as they do conspire, and the loss arises entirely from the opposition betwixt them; for all powers which do not directly conspire, oppose one another in a certain degree. Hence when the acting forces make an obtuse angle with each other, as in figs. 12, 13, there is then a very great loss of power, because there is such an opposition betwixt them; and it is only that small part of their motion which acts in concert that can produce any in the body acted upon; but this, as in the former case, is exactly double to what it would be if only one of them acted upon the body. Thus, in fig. 12. the whole direction of the powers from E to B, and from B to C, is in absolute opposition to each other; and therefore, supposing them equal, must be totally lost. In the direction AD they conspire; and therefore the body will move twice as far in that direction as is expressed by that of the lines in the figure; that is, from A to D, instead of only from A to E, which is the limit of each of the forces. In cases of this kind, the more obtuse the angle is at which the forces act, the greater is the loss of power, as is evident from an inspection of figs. 12, 13.

Some who are but beginning to the study of mechanics may be embarrassed in their ideas how two forces acting at right angles to each other can in any manner of way oppose each other, as in fig. 7.; as we find that a body descending by the force of gravity will carry the body farther in its own direction than the other, and the whole will be represented by a parallelogram, as in fig. 8. In this case it is evident that the body has moved exactly in conformity to the direction of both powers, viz. the whole length of AB, and the whole length of AC. In this case also the loss of motion is less than in the former; because the length of the oblong parallelogram approaches much nearer to the sum of the sides than the diagonal of a square; and the greater inequality there is betwixt the sides, the less power is lost.

Plates
CCLXXXII.
CCLXXXIII.

Mechanical
Power.
Plate
CCLXXXIII.

may be pushed to a side seemingly by the least force imaginable. But this will easily be understood from fig. 14. which is only a square turned into another posture. Here it is plain that the powers AB and AC oppose each other as much as they conspire; that is in the proportion of half the diagonal of the square: this quantity therefore is totally lost, and the body proceeds with the other half; which being doubled on account of each of the powers proceeding with one half of the diagonal, gives the whole diagonal for the total motion produced.

5
Ultimate
cause of
this shown

But however plain this may appear from an inspection of the figure, it is by no means so apparent when we come to try it by numbers. Thus, supposing each of the sides AB and AC to be 5, the diagonal of the square will be nearly 7.071; but if from the sum of the sides 10 we take this number, or half of it from each number, we will have only 2.919 for the whole motion, instead of the diagonal 7.071 which is the reality. From an inspection of the figure also we plainly see, that if one diagonal is gained by the powers conspiring together or acting in concert, another is lost by their opposition. It is natural therefore to inquire, How can any two powers gain or lose more than their own quantity; for the two powers taken together amount but to *ten*, but the two diagonals, one of which is gained and the other lost, amount between them to upwards of *fourteen*? To solve this seeming paradox, we must consider, that as the diagonal of the square ABCD, fig. 14. is generated from the two sides AB and CD, so these sides themselves may be accounted the diagonals of two other smaller squares *aBAE* and *AE/C*, fig. 15. each of the sides of which is half the diagonal of the large one. From the sum of the sides of these squares, which to the large square are the source of power, it is evident that a diagonal may be taken and another remain, because each of the sides is half a diagonal.

6
All powers
are com-
pounded of
others.

Hence we not only see that every mechanical power we are acquainted with *may be* derived from two others, but have a demonstration that it *actually is so*; not only because this supposition explains the phenomena, but because we are involved in an inexplicable contradiction if we suppose any thing else, for no power can lose more than its own quantity; and if it loses more than one half, it can never produce effects equivalent to another half; which we see must be the case, if we suppose any two *unoriginated* powers acting upon one another at right angles, or indeed any other way, though the supposition of their acting at right angles makes the matter more plain than any other. This leads to a very curious speculation concerning the origin of mechanical motion, of which an account is given under the article *MOTION*.

7
Experiment
illustrating
the truth of
this doc-
trine.

Hitherto we have considered both the powers not only as equal at the beginning, but as continuing so throughout their whole course: but this is a supposition which scarcely exists in nature, unless the powers are kept from exerting themselves otherwise than by simple pressure. Thus, in fig. 16. supposing the body A pulled in the direction AB by the weight D of five pounds put over the fixed pin B, and pulled in the direction AC by C, another weight of five pounds fastened to it by a string; the whole will be kept in the position represented in the figure by a weight of

7.071 pounds fastened to it by a string, and put over the pin F, situated any where in the diagonal line FAG; and let us add ever so much weight, provided it be done to D and C in the proportion of five, and to E in that of 7.071, the body A will remain suspended in the air without altering its position in the least.

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Power.

If, instead of making the weights equal, we make one exceed the other in any proportion, the weight necessary to counteract them will never be required equal to both, but will always be in proportion to the diagonal of the parallelogram of which the weights represent the sides. Thus, in fig. 17. if we suppose the body A pulled in the direction AB by the weight G of four pounds, and in the direction AC by the weight H of three pounds, it will be kept suspended by the weight F of five pounds put over the pin E, placed any where in the diagonal line EAD. For the diagonal AD is equal (by Prop. 47. Book 1. of Euclid) to the square-root of the sum of the squares of the sides AB and AC, or CD and BD. But the square of AB is $4 \times 4 = 16$ pounds, and that of AC is $3 \times 3 = 9$ pounds by the supposition; and $16 + 9 = 25$, the square-root of which is 5; and these proportions will be found to hold invariably in whatever way we apply mechanical powers; though, when they act at oblique angles, the diagonals must be calculated by other methods.

If, however, we set any of the powers at liberty, we shall find that none of them will continue the same even for a moment. If we suppose any of them to be the power of gravity, which is the most constant and equable we are acquainted with, this is found to increase prodigiously; and, on the other hand, if we suppose one of them to be a projectile force, as of a stone thrown by the hand, we will find in like manner, that it will be diminished to a great degree in a very little time. In all cases, however, where a body is acted upon by two forces either increasing or decreasing, unless both increase or decrease exactly in proportion to their original quantity, the body acted upon will describe a curve. Thus, in fig. 18. suppose the body A to be acted upon by two equal powers *Ab* and *Ac*; at the end of the first moment it will be at *d*, the end of the diagonal of the small square *Abcd*: but if now the force *Ac* be increased to double what it was in the preceding moment, the body will at the end of the second moment be at *g*, the extremity of the parallelogram *defg*; and by another increment of the same power, will be at the end of the third moment at *k*, and so on. This is similar to the motion of falling bodies, of which we shall treat hereafter; but if one of the powers diminishes instead of increasing, the phenomena will be different. Thus, in fig. 19. supposing the body at A to be actuated the first moment by the two forces *Ab* and *Ac*; at the end of that moment it will be at the extremity of the diagonal *Ad*; but next moment, supposing the power *Ac* to be diminished one half, the other remaining the same, it will then be at *g*, and the third moment at *k*, thus describing another kind of curve. If, while one of the powers decreases the other increases, a third kind of curve will be generated; and by proper management of these powers, the body may be made to describe the segment of a circle, as in fig. 20; where

8
Curvilinear
motion
how pro-
duced.

Mechanical
Power.Machine
for show-
ing the
action of
oblique
powers.
Fig. 21.10
Of bodies
acted upon
by three
forces.

where it is manifest that one power continually decreases while the other increases.

The following machine has been contrived to illustrate the operation of oblique powers upon each other. ABCD is a wooden square, so contrived that the part BEFC may draw out from it or be pushed back at pleasure. To this is joined a pulley H, freely moving upon its axis, which will be at H when the piece is pushed in, and at *b* when it is drawn out. To this part let the ends of a straight wire *k* be fixed, so as to move along with it under the pulley; and let the ball G be made to slide easily upon the wire. A thread *m* is fixed to this ball, and goes over the pulley to I; by which means the ball may be drawn up on the wire parallel to the side AD, when the part BEFC is pushed as far as it will go into the square: but when this part is drawn out, the ball must be carried along with it parallel to the bottom of the square DC. Thus the ball may be drawn either perpendicularly upward by pulling the thread *m*, or moved horizontally by pulling out the part BEFC, in equal times and through equal spaces, each power acting equally and separately upon it. But if, when the ball is at G, the upper end of the thread be tied to the pin I, in the corner A of the fixed square, and the moveable part BEFG be drawn out, the ball will then be acted upon by both the powers together: for it will be drawn up by the thread towards the top of the square, and at the same time carried with its wire *k* towards the right hand BC, moving all the while in the diagonal line L, and will be found at *g* when the sliding part is drawn out as far as it was before; which then will have caused the thread to draw up the ball to the top of the inside of the square, just as high as it was before when drawn up singly by the thread without moving the sliding part.

If a body is acted upon by three forces, the investigation becomes somewhat more complex, though it is still easily explained on the foregoing principles. Thus, in fig. 22. let the body A be pulled sidewise in opposite directions by the two equal weights G G put over the pins B and C, and directly downward by the weight H, the same with G. In this case it is plain, that each of the weights G and G sustain one half of the weight H; and as both taken together are double in quantity to H, it might be supposed that they would be abundantly able to keep the body A in its position. The case, however, is very different. As each of the weights G sustains only one half of H, it follows that H acts only with one half of its weight upon them. The body A, therefore, is pulled in the direction AC and AB by two powers, each of which is as 2, and in the direction AF by two, which are only as one. With the force AB, therefore, were it to act upon it singly, it would describe the diagonal AD, and with that AC it would describe the diagonal AE. These two diagonals are in truth the forces by which it is now actuated, and the effect is precisely according to the principles already laid down. By each of them taken separately, the body would be brought down to F; their lateral action being in opposite directions destroys itself; and by their conjunct action, the body would be brought down to double the space AF, that is to H, and consequently would describe the diagonal of the small square ADHE; which diagonal is

equal to the side of the large one, and the very same that the body would have described though the two lateral weights had not been present.

Hence it appears, that though we pull a body ever so strongly by strings in a direction opposite to each other, it will still require an equal weight to retain it in equilibrio; that is, supposing the strings to be perfectly flexible. There may indeed be a deception in making an experiment of this kind; for the body will never descend as far as H, nor near that distance; but then it must be observed, that when the strings begin to bend in the middle, the weights G G act in a direction different from what they did originally, and pull the body upwards instead of laterally; in which case, it must either remain at rest, as in fig. 23. or move upwards, as in fig. 24.

When the powers act in the direction AB and AC, fig. 23. one half of the weight H is sustained by each of them. The body is therefore pulled in the directions AB and AC by two powers, each of which is as 2; and in the direction AF by other two, each of which is as 1. By the power AB it would be made to move in the diagonal AD of the parallelogram ABDF; and by the power AC, in the diagonal AE of the parallelogram ACFE; but these diagonals are equal and contrary to each other, and therefore destroy each other; of consequence the body remains at rest.

In fig. 24. the body A with the weight H appended to it is placed nearer to the point B than to C by one-third. Of consequence, as will afterwards be explained, it bears two-thirds of the weight H, while C sustains only one-third. The acting powers, therefore, are now the diagonals of two unequal parallelograms. One power draws the body in the direction AB with a force as 3, while the weight H draws it in the direction AH with a force as 2. By it, therefore, the body would be drawn in the direction of the diagonal AD of the parallelogram BDEA. On the other hand, it is acted upon by the power AC, which is likewise as 3, while the weight H draws it down with a force only as 1. By this, therefore, it would be drawn in the direction of the line AG, the diagonal of the parallelogram ACGF. We must now make these two diagonals the sides of a third parallelogram ADIG; and in the diagonal AI of this parallelogram it will go, for the reasons already given.

If four or more forces act upon a body in different directions, the case becomes very complicated; and if many powers be employed, it will by no means be easy to determine *a priori* which way the body will tend. Cases of this kind, however, seldom occur in practical mechanics; and when they do, it will be better to determine them by actual experiment than by a tedious investigation, which, after all, may be liable to a mistake. We forbear, therefore, to give more examples; though, if the reader inclines to exercise his ingenuity, he must proceed upon the plan already laid down, viz. by combining the different powers together; forming diagonals from these parallelograms; combining these diagonals into a third set of parallelograms; and the diagonals thence resulting into a fourth set, &c. until at last a single one is met with prevailing over all the rest, or two destroying each other. If one prevails, the

If
Of bodies
acted upon
by four or
more for-
ces.

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Power.

body will move in that direction; but if two destroy each other, the body will remain at rest.—It must also be observed, that in making drawings of this kind, the longest line always represents the greatest power, and that without a single exception to the contrary. By mere mechanical construction, therefore, with scale and compass, we may be able to ascertain the direction of oblique powers to as great accuracy as we can ever have occasion for in practice.

12
Of the various ways
in which
powers
may be
produced.

We shall conclude this subject with observing, that as every power certainly is produced by the action of two others, so it may be by innumerable others. Thus, in fig. 25. the power AD may be produced by the two sides of the square ABDC; by the sides of the oblique-angled parallelogram AaDb, of the smaller parallelogram AcDd; or of the large parallelogram AE, DF, &c. Hence it is easy to produce any power, whether strong or weak, from the action of any two powers whose direction we have at our command, without regard to their quantity. If we make the generating powers conspire together, a strong one will be produced; or if they oppose each other to a certain degree, they will produce a weak one. The strongest that can be produced by any two powers is when they act the same way in a direct line.

§ 6. Of the Relation betwixt Velocity and Power.

HITHERTO we have supposed the bodies to be moved not to make any resistance to motion in any direction, unless opposed by a fixed obstacle; in which case, velocity and power would be the same thing; and thus it always appears to be when we represent powers by lines upon paper. But when we come to practice, matters turn out very different. A ball of cork moving with any degree of velocity will not have an equal power with one of wood moving with the same velocity; neither will a wooden ball have the same power with a metallic one. Among the metals themselves, too, there is a difference; for the lighter metals are inferior in power to the heavier ones. Gravity, therefore, must be accounted the power which gives to moving bodies what we call their *force* or *momentum*; for according to the weight of a body, so will its impulse always be, and that whether it moves upwards, downwards, sidewise, or in a circle. The absolute power of a body, therefore, must be measured by comparing the gravity of different bodies together, and denoting one of them by unity; making the other 2, 3, 4, &c. according as it is twice, thrice, or four times, the specific gravity of the former. Thus let an hollow ball of metal be filled with water; if the ball be very thin, we may let its weight pass unnoticed, or we may make allowance for it in the calculation. Supposing the weight of this ball then to be 1, if it moves with a velocity of 10 feet in a second, its absolute force or momentum will be $10 \times 1 = 10$; a ball of stone of equal size which weighs three times as much as the former, if moved with an equal velocity, will have a force of $10 \times 3 = 30$; a ball of tin which weighs 7 times as much, will have a momentum of 70; and a ball of gold or platina would have a momentum of 190 or 200.

This will also hold exactly, by increasing the *quantity* of matter, where it is deficient in specific gravity. Thus, if the hollow metallic ball be increased in dia-

meter, so that it shall equal in weight the ball of stone or of metal, it will have the very same force with that ball; and in like manner, it might be made to have a momentum equal to the metallic balls, though not without a very considerable increase of size.—Great Mr Atwood's observations on the ancient battering-rams. 13
masses of matter will therefore supply the place of great velocity: and hence Mr Atwood observes, that the battering-rams used by the ancients were no less powerful in beating down the walls of cities than the modern artillery. "The battering-rams of the ancients (says he) consisted of very large beams of wood terminated by solid bodies of brass or iron; such a mass being suspended as a pendulum, and driven partly by its gravity and partly by the force of men against the walls of a fortification, exerted a force which, in some respects, exceeded the utmost effects of our battering cannon, though in others it was probably inferior to the modern ordnance. To compare the effects of the battering-ram, the metal extremity of which suppose equal to a 24 pounder with a cannon-ball of 24 pounds weight; in order that the two bodies may have the same effect in cutting a wall or making a breach in it, the weight of the aries must exceed that of the cannon ball in the proportion of the square of 1700, the velocity of the ball*, to the square of the velocity with which the battering ram could be made to impinge against the wall expressed in feet. If this may be estimated at 10 feet in a second, the proportion of the weights will be that of about 2,890,000 to 100, or of 28,900 to 1; the weight of the battering ram therefore must be 346 ton. In this case the battering-ram and the cannon-ball, moving with the velocities of 10 and 1700 feet respectively in a second, would have the same effect in penetrating the substance of an opposed obstacle: but it is probable that the weight of the aries never amounted to so much as is above described; and consequently the effects of the cannon-ball to cut down walls by making a breach in them, must exceed those of the ancient battering-rams: but the momentum of these, or the impetus whereby they communicated a shock to the whole building, was far greater than the utmost force of cannon-balls; for if the weight of the battering-ram were no more than 170 times greater than that of a cannon-ball, each moving with its respective velocity, the moments of both would be equal; but as it is certain that the weight of these ancient machines was far more than 170 times our heaviest cannon-balls, it follows, that their moment or impetus to shake or overturn walls, &c. was far superior to that which is exerted by the modern artillery. And since the strength of fortifications will in general be proportioned to the means which are used for their demolition, the military walls of the moderns have been constructed with less attention to their solidity and massy weight than the ancients thought a necessary defence against the aries; that sort of cohesive firmness of texture which resists the penetration of bodies being now more necessary than in ancient times: but it is manifest, that even now solidity or weight in fortifications also is of material consequence to the effectual construction of a wall or battery." This difference between the momentum and force of penetration is exemplified in knives, wedges, or any

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Power.

13
Mr Atwood's observations on the ancient battering-rams.

* See the article Gunnery.

any sharp instruments, where a sudden blow will cause a much deeper penetration than a weight vastly greater than could be stirred from the earth by the force of the blow.

§ 7. *Of the Multiplication and Increase of Power.*

WE have now seen that *power*, absolutely so called, acts in a kind of double capacity, *viz.* either when it impresses a great velocity upon a small quantity of matter, or when it impresses a small velocity upon a great quantity of matter. It must, however, be remarked, that the matter we speak of is always supposed subject to the laws of gravity; for what would be the consequence of putting a body in motion which had no gravity we cannot possibly conceive, because we never saw any such body. Philosophers indeed mention the *vis inertia* of matter as property distinct from gravity; but the arguments in favour of this property are now generally looked upon to be inconclusive, and gravity and the *vis inertia* looked upon to be the same.

The two modes in which absolute power acts, come precisely to the same thing whether the velocity be great or small: for it is evident, that when two pounds move with the velocity of 1, it is the same thing with one pound moving with the velocity of 2; the *velocities* as well as *powers* being exactly the same. But there is a third way in which power may be directed, in which it has not the relation to velocity already mentioned; and that is, by simple pressure, where no motion is admitted. Thus may the smallest power be made to augment itself to an inconceivable degree, as in fig. 26. Here, suppose the body A to press directly downwards upon the line AB fastened to the small wheel B, moveable upon an axis. If we suppose the extremity of the line at A to be supported so that it shall not fall to a side, the wheel B will press downward with the whole of the weight A upon the line EF, and consequently the line g must sustain the whole of this weight. But if the line EF be supported so that it cannot move perpendicularly downwards to g, it will then roll along the line EF from B towards F; and this tendency to roll in the direction just mentioned will be exactly equivalent to the weight A. Any body therefore laid on the top of a stick set up at an angle of 45 degrees, will require a power double to its own weight to keep it steady at the foot, abstracting from that which will be necessary to prevent it from falling to a side.

If now we suppose the wheel B to press laterally upon another C; and that other, by means of the line CD and wheel D, to press upon the two obstacles i and k, both of which it touches at an angle of 45 degrees; it is plain that not only each of these obstacles must bear the whole weight of the body A, but the reaction of the wheel D will press down the wheel C in the direction Cb with the very same force that D is pressed upwards. This is entirely similar to the case of the man in the boat represented in fig. 1. Thus the weight A produces a pressure equal to five times its own weight; and by multiplying the wheels and rods, we might increase the pressure as much as we please. The case is similar to that in hydrostatics, where a little quantity of liquid may be made to burst the strongest vessel.

SECT. II. *Of the Mechanical Powers.*

By these we understand such simple machines as are useful for comparing the velocity of various bodies together, and impressing them with greater or smaller degrees of it at pleasure; by which means we may either cause a small weight overcome a great one, or by means of a great one we may make a small weight move through a space proportionably great. Thus by means of some of these powers, indeed by any of them, we may cause a weight of one pound, by moving through the space of ten feet, raise another of ten pounds through one foot; or *vice versa*, by a weight of ten pounds moving through the space of one foot, we may make a single pound move through the space of ten feet; but by none of the powers will we be able, by moving a weight of ten pounds through one foot, to move a single pound through 11 feet; nor by a single pound moving through a space of nine feet will we be able to raise a weight of ten pounds through the space of one foot. None of the mechanic powers, as they are called, therefore, can make any absolute increase of the power applied; all that they can do is to alter the velocity of the power applied, and thus transfer it either to a larger or smaller body at pleasure; and upon this principle depends the whole practical part of mechanics. The mechanical powers are six in number, *viz.* the *lever*, *wheel in axis* or *axis in peritrochio*, the *pulley*, *inclined plane*, *wedge*, and *screw*, of all which we shall now treat particularly.

§ 1. *Of the Lever.*

THIS is the most simple of all the mechanical powers, and is usually no other than a straight bar of wood or iron supported by a prop, as in fig. 27. The weight to be raised is suspended at the short arm of the lever A; and exactly in the inverse proportion of the distance of the weight from the fulcrum or prop C, is the quantity of the weight at B necessary to keep it in equilibrio. Thus if the weight at A be distant one foot or one inch, it signifies nothing which, from the prop, it will require an equal weight placed at the same distance on the other side, as at 1, to balance it; but if the latter be placed at 2, then only half the weight suspended at A will balance it: if the small weight is placed at 3, then only one third will be necessary; if at 4, only one-fourth, &c. and if, as in the figure, it be removed to 10, then only one-tenth part will be required to make a balance. It must still be remembered, however, that if the lever is put in motion, the small weight must move through a space ten times as great as that through which the large one moves; so that in fact there is not any acquisition of power by means of the lever, though it is one of the instruments most commonly used in mechanics, and very serviceable in loosening stones in quarries, or raising great weights to a small distance from the ground; after which they may be raised to greater heights by other machines.

In making experiments with this kind of lever, it is necessary either to have the short arm much thicker than the long one, so that it may exactly balance the latter, or a weight must be appended to it just sufficient to keep it in *equilibrio*; otherwise no accuracy can

be

14.

First kind
of lever.
Plate
CCLXXXIII.

Mechanical
Powers.
15
Of the steel-
yard.

be expected. This lever is the foundation of balances of all kinds, whether of the common kind or of that called the *Roman statera* or steel-yard. The latter is no other than the lever represented in fig. 27. For if a scale is appended to the end A of the lever, and a weight, suppose of one pound, used as a counterpoise to the body which is to be put in the scale, it will show exactly the weight of that body, by putting it at a proper distance from the fulcrum upon the long arm. Thus if the weight when placed at the division 5 counterpoises that placed in the scale, it shows that the body weighs exactly five pounds: if it balances at 6, then it shows that the body weighs six pounds, &c. But for a more particular account of this instrument, see the article *STEEL-YARD*. To this kind of lever may be reduced several kinds of instruments, as scissars, snuffers, pincers, &c.

In levers of this kind, the fulcrum C must support both the weight to be raised and likewise that which raises it; so that the weight upon C must be the greater in proportion as the arm CB of the lever is shorter. Thus, if the arms are both equal, the fulcrum C must bear double the weight at A: if the one arm is double the length of the other, then it has only to bear the weight to be raised, and one half more; because any weight at 2 will balance one double to itself at 1; but if removed to 10, the fulcrum will only have $1\frac{1}{10}$ to bear.

16
Second
kind of
lever.

In some cases, the weight to be raised is placed between the acting power and the fulcrum, as in fig. 28. This lever is more powerful than the other, and is likewise more easily supported, because only part of the weight to be raised, and none of that which raises it, lies upon the fulcrum. Thus in fig. 28. let the extremity A of the lever AB rest upon a fulcrum at c, and let the small weight 1, by means of a string put over the wheel or pin C, pull up the other extremity; this weight 1 will then counterpoise the large one 10, and very little additional force will be required to raise it up. It is also plain, that the whole weight to be raised being 10, the fulcrum sustains only 9 of it, for the other 1 is sustained by the string BC. It is plain also, that a lever of this kind only ten feet long will raise as great a weight as another of the former kind eleven feet in length; nevertheless there is not any absolute gain of power, because the small weight 1 must move through ten times as much space as the large one; and thus the quantity of motion is exactly equal in both. To this kind of lever we may reduce oars, doors turning upon hinges, cutting knives fixed at the point of the blade, &c. From it also we see the reason why two men carrying a burden upon a pole may bear unequal shares of the weight; for the nearer any one of them is to the burden, the greater share he bears; and if he goes directly under it, he must bear the whole. Hence, if two persons of unequal strength are to carry a burden in this manner, the weaker should always be placed at the greatest distance from it.

17
Third kind
of lever.

If in this lever the moving power be put in the place of the weight, it acts at a great disadvantage; and a very great power will be requisite to overcome a small weight. The reason of this is plain from an inspection of fig. 28; for it is the same thing whether we suppose the body 10 to be the moving power, or the weight to be raised; in either case, nine-tenths of

it are spent upon the fulcrum at o; and the other tenth part at 10 will be able to do no more than balance the weight 1. Levers of this kind are only made use of when we wish to give a considerable degree of velocity to bodies: and hence the flies of clocks, mill-stones, &c. may be accounted levers of this kind; for in these the moving power is applied to a pinion near the centre of motion, and acts at a great disadvantage; the muscles of the arms or legs of a man, by their insertion near the joints, likewise act as levers of this kind; and hence the power exerted by a muscle is always much greater than the force it has to overcome.

In all cases in which the lever is applied, it is necessary, in order to give it the greatest advantage, that the moving power act in a direction exactly perpendicular to the lever itself. If this be not the case, it will be necessary to lengthen the lever in proportion to the obliquity. Thus in fig. 29. suppose the straight lever AB to rest on the fulcrum C, so that a weight of one pound may counteract 10; if the lever be bent in the direction AD, it will then be necessary to lengthen it somewhat in order to produce the same effect. If bent in the direction CE, it must be farther lengthened, and still farther if bent in the direction CF. The reason of this is, that when the weight acts on the bended lever ACF, ACE, and ACD, a part of its force is spent in giving, or attempting to give, a lateral motion to the fulcrum C; and the part thus lost is exactly equal to the advantage gained by the greater length of the lever. To make a lever of a determinate length act always with the same power, it will be necessary to have some contrivance by which the moving power may act always perpendicularly to it; as by having two circular pieces of wood or other solid matter fastened to the ends of it, round which the ropes may wrap themselves when it is put in motion, such as are represented by *ab* and *BG* in the figure.

Fig. 30. shows a kind of lever bent so that one part of it may form a right angle with the other. Here the prop or centre of motion is at the angular point C. P is a power acting upon the longer arm AC at F, by means of the cord DE going over the pulley G; and W is a weight of resistance acting upon the end B of the shorter arm BC. If the power be to the weight as BC is to CF, they will remain in equilibrium. Thus suppose W to be five pounds acting at the distance of one foot from the centre of motion C, and P to be one pound acting at F five feet from the centre C, the power and weight will just balance each other. A hammer drawing a nail is a lever of this kind. In this lever the pressure upon the fulcrum downwards is just equal to the weight to be raised; but there is likewise a lateral pressure equal to the weight P; so that the centre of motion must have a double support, otherwise the whole lever with the weight would be drawn towards the side in the direction BC.

If, as in fig. 31. and 32. the lever be bent so as to form two sides of a square, the weight to be raised will always be equal to that upon the fulcrum, in whatever place the fulcrum may be put; but both will vary according to the distance from the angular point. Thus, if as in fig. 31. the fulcrum be placed at the angular point A, the weight F appended to the extremity B

18
In what
manner a
power ap-
plied to a
lever acts
to the
greatest ad-
vantage.
Plate
CCLXXXIV.

20
Fifth kind
of lever.

MECHANICS.

Plate CCLXXXIII.

Fig. 13.

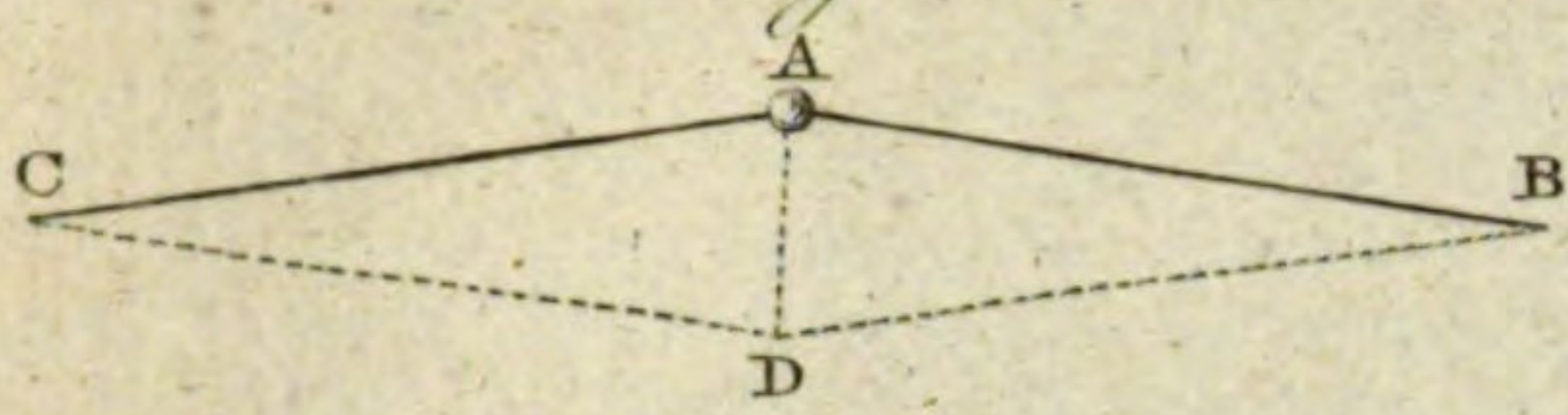


Fig. 14.

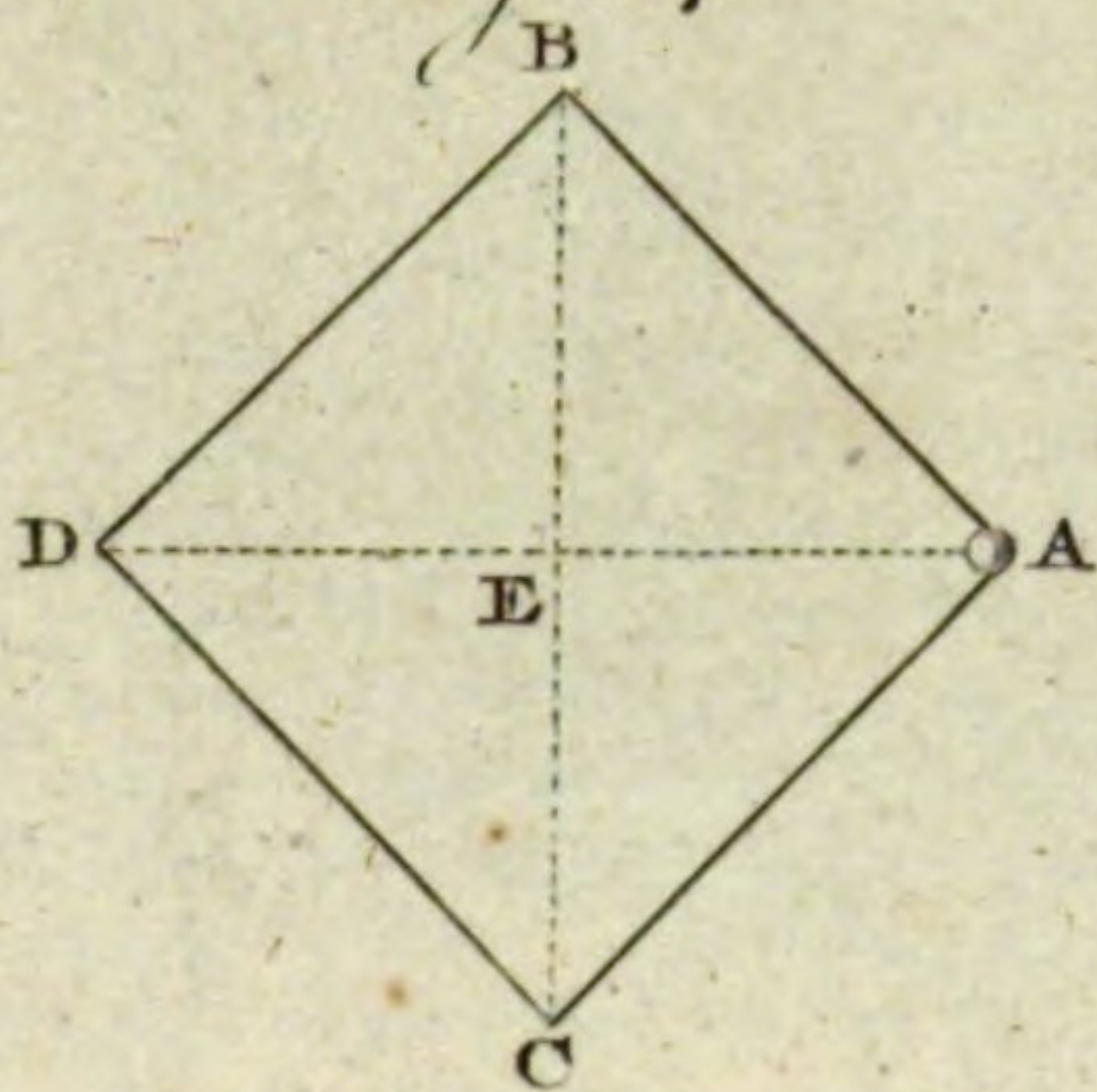


Fig. 15.

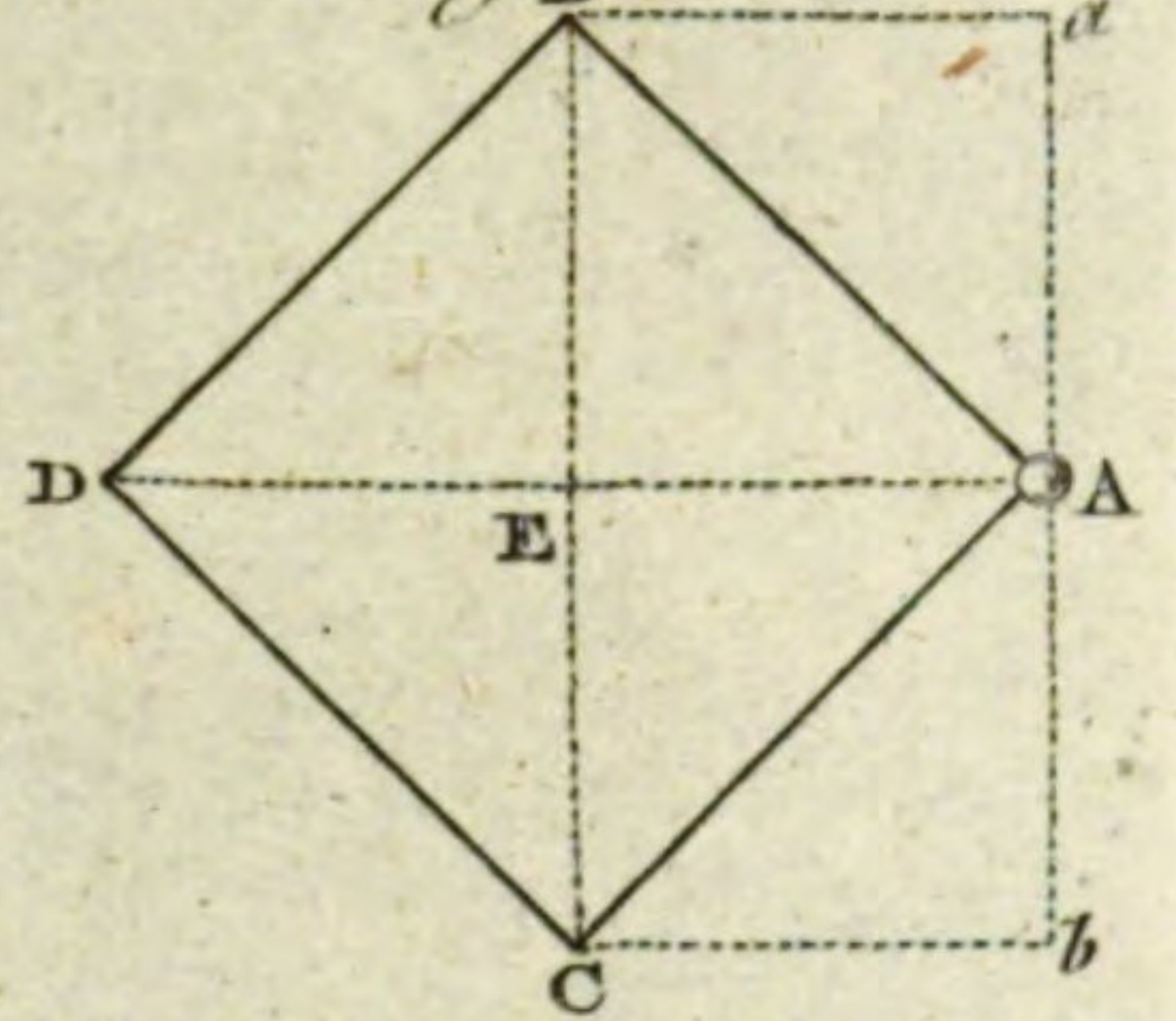


Fig. 16.

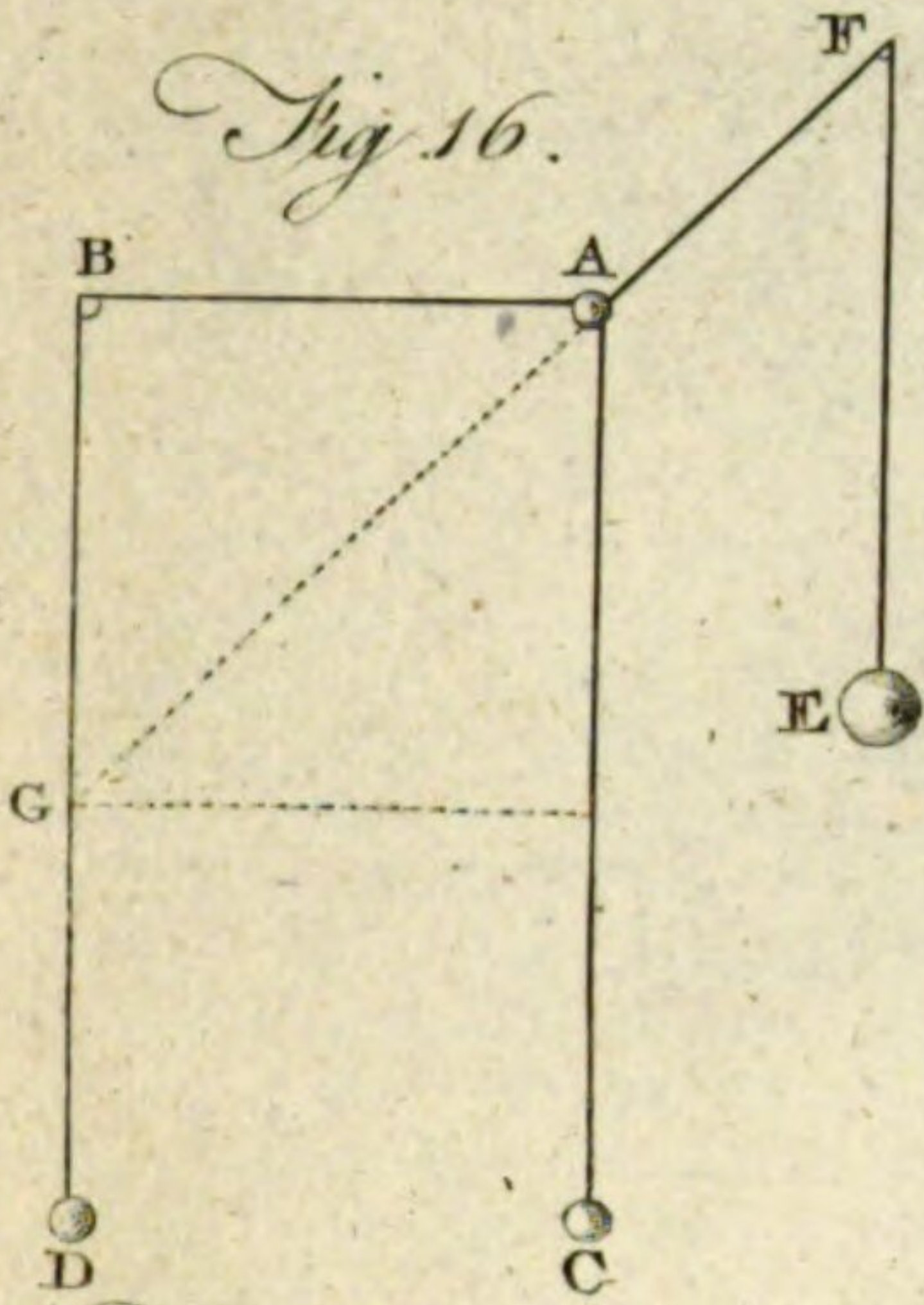


Fig. 17.

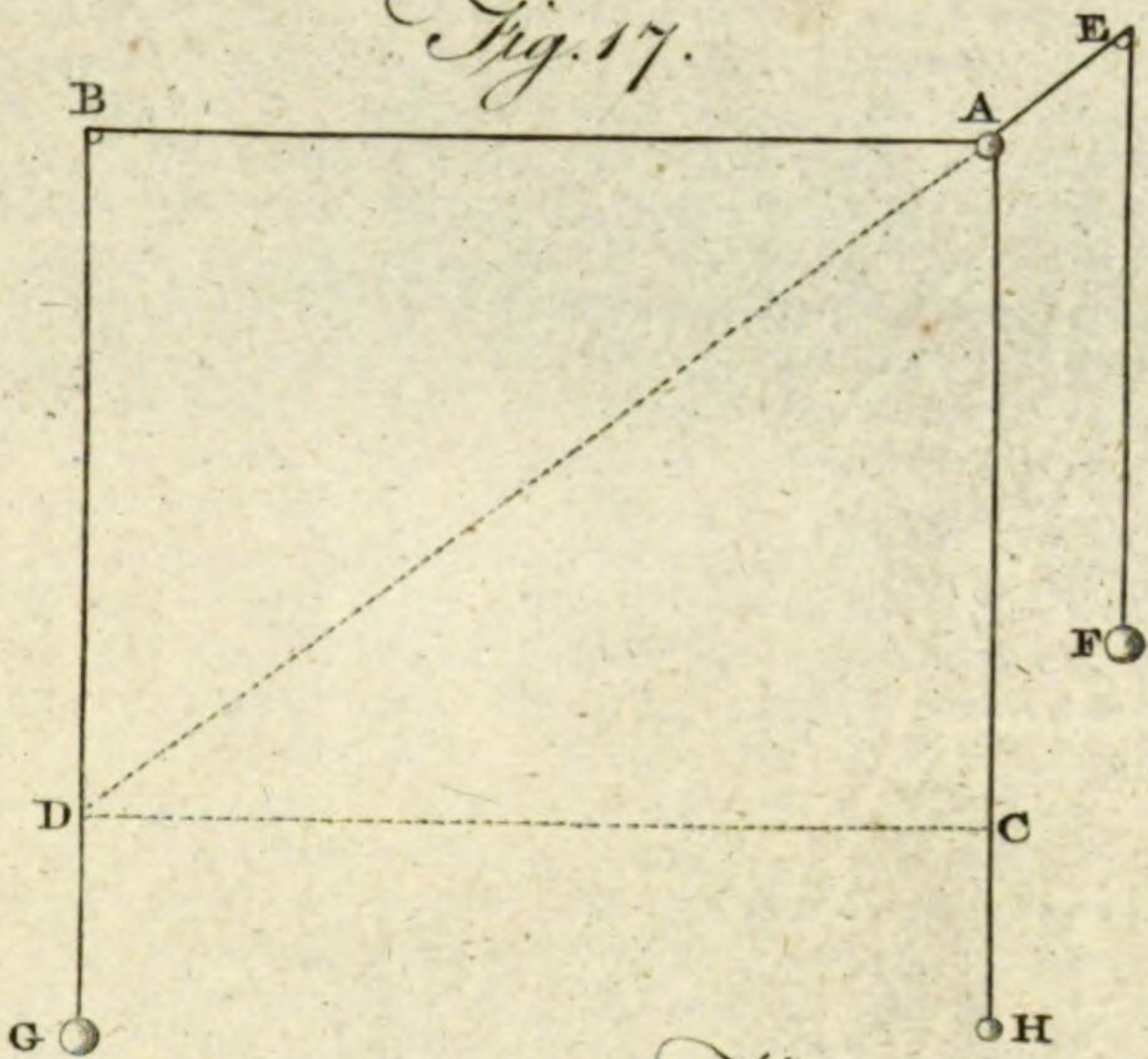


Fig. 23.

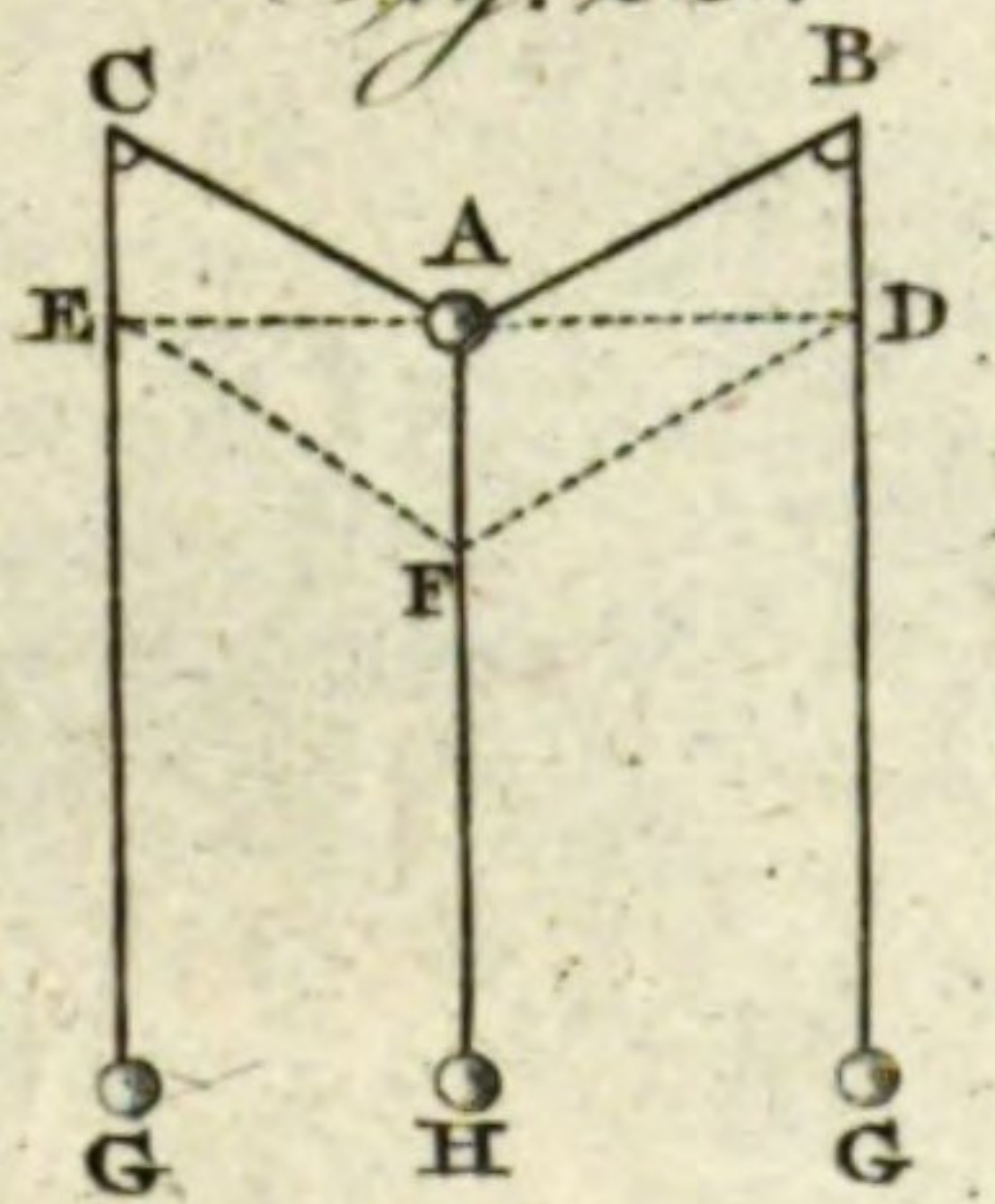


Fig. 18.

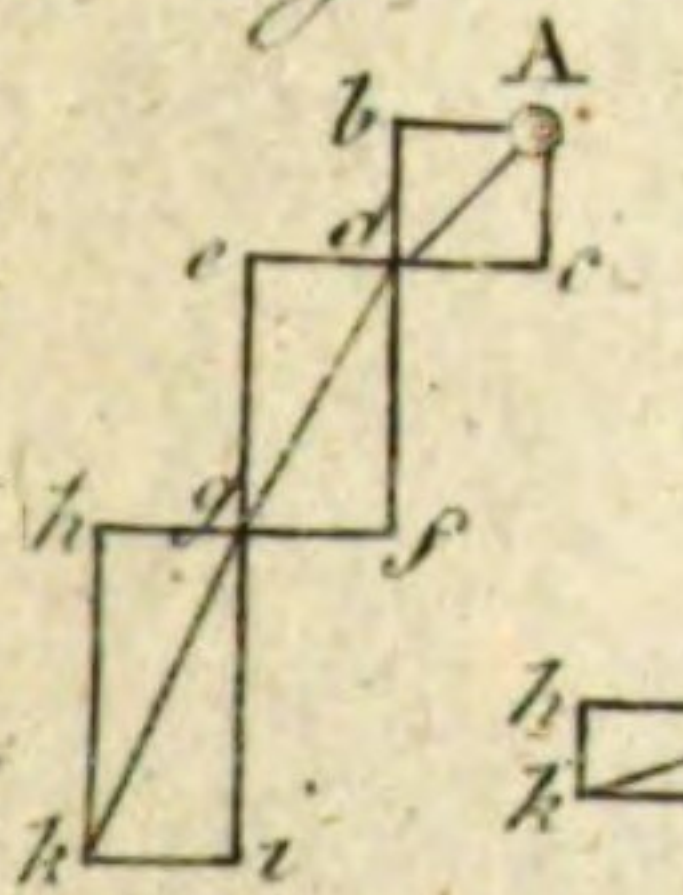


Fig. 19.

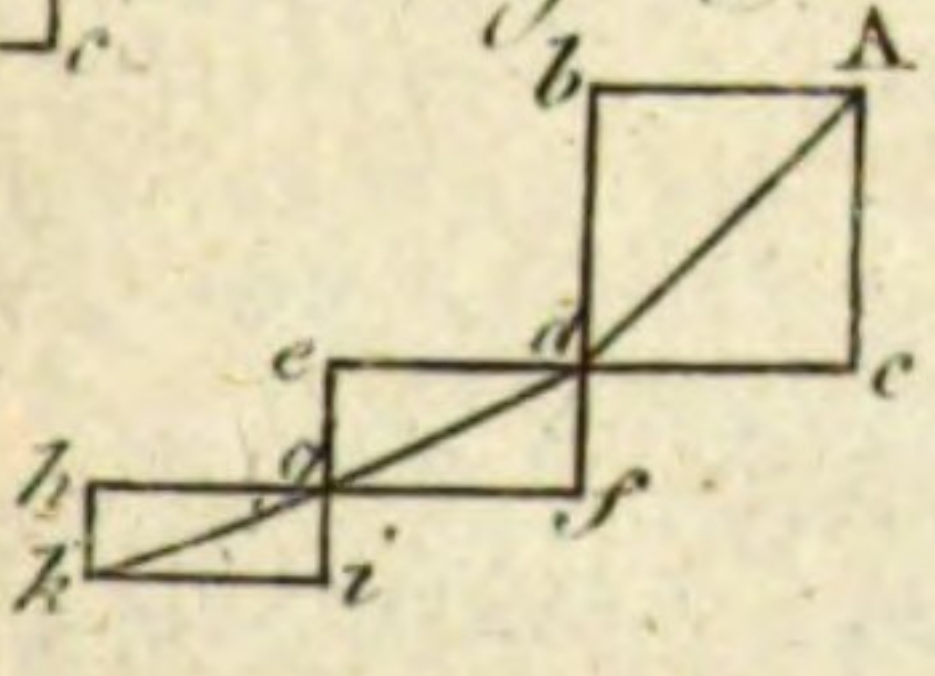


Fig. 22.

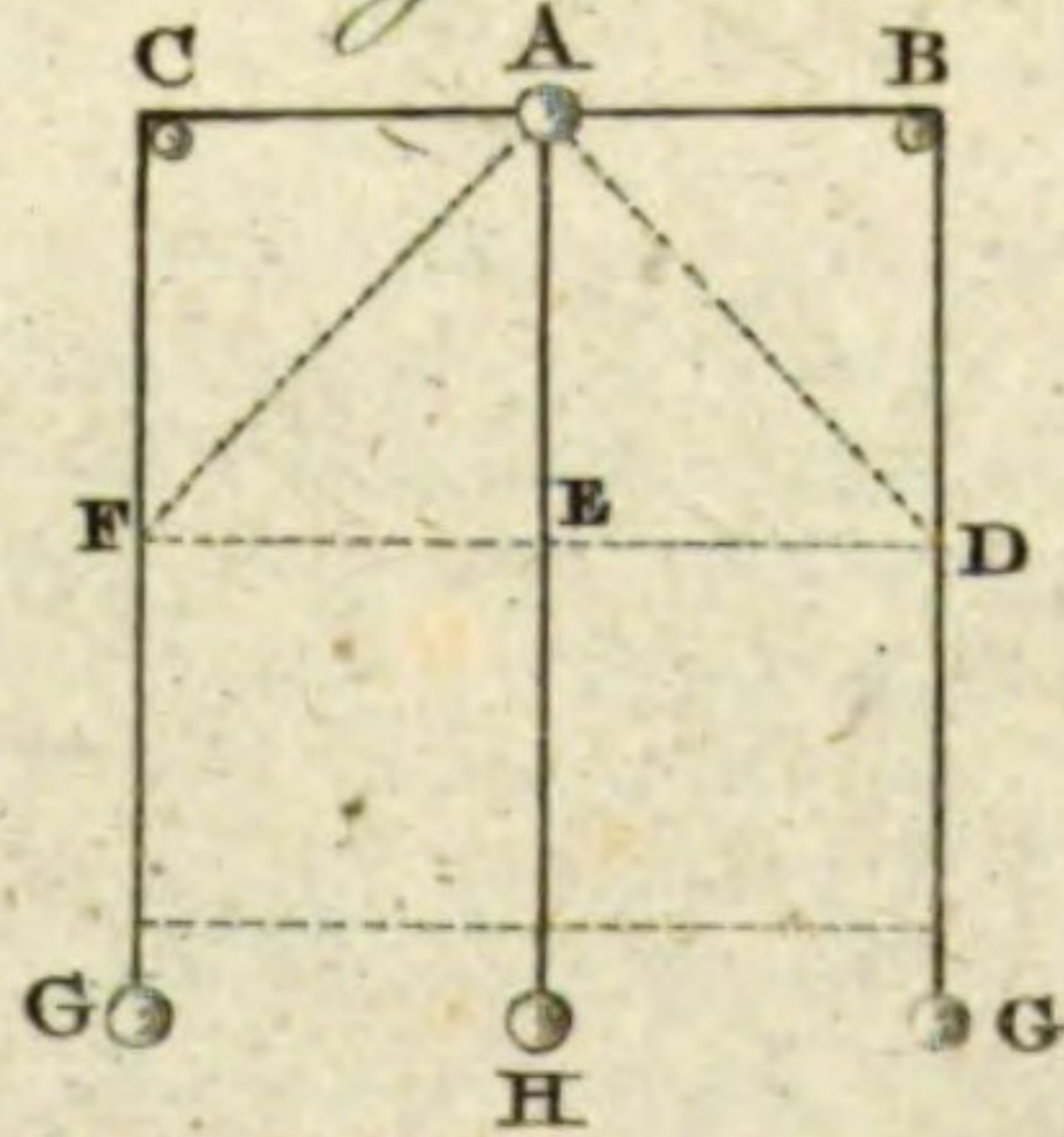


Fig. 21.

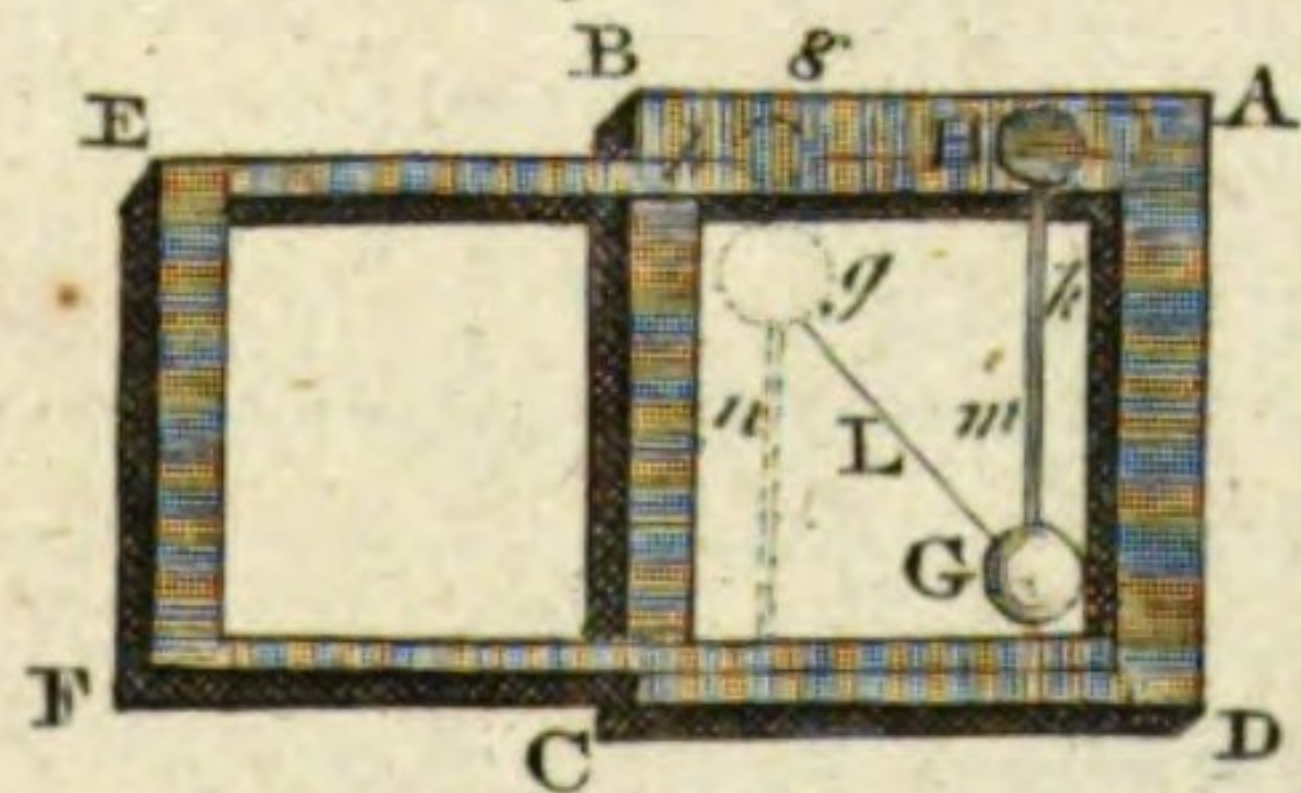


Fig. 24.

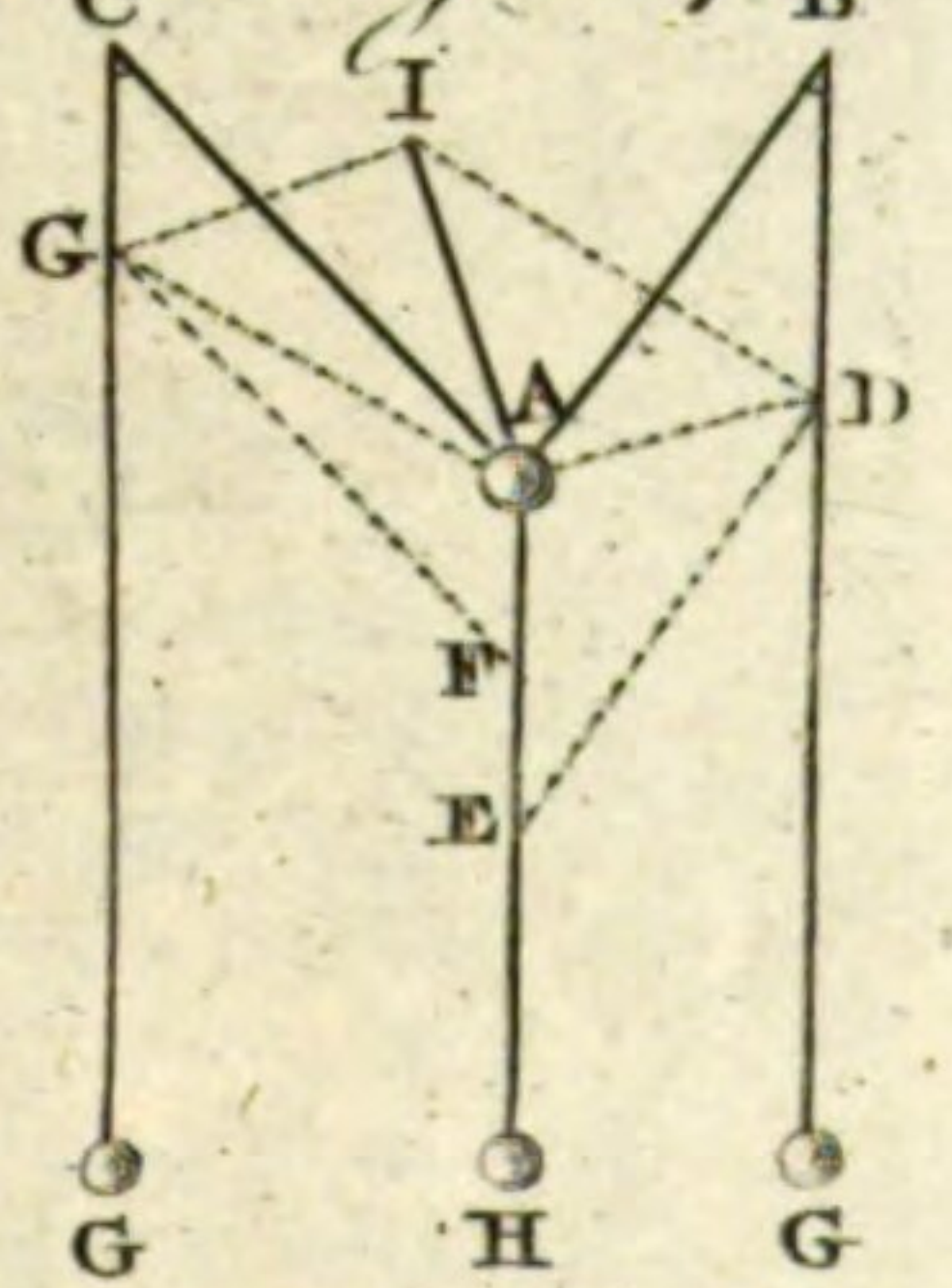


Fig. 25.

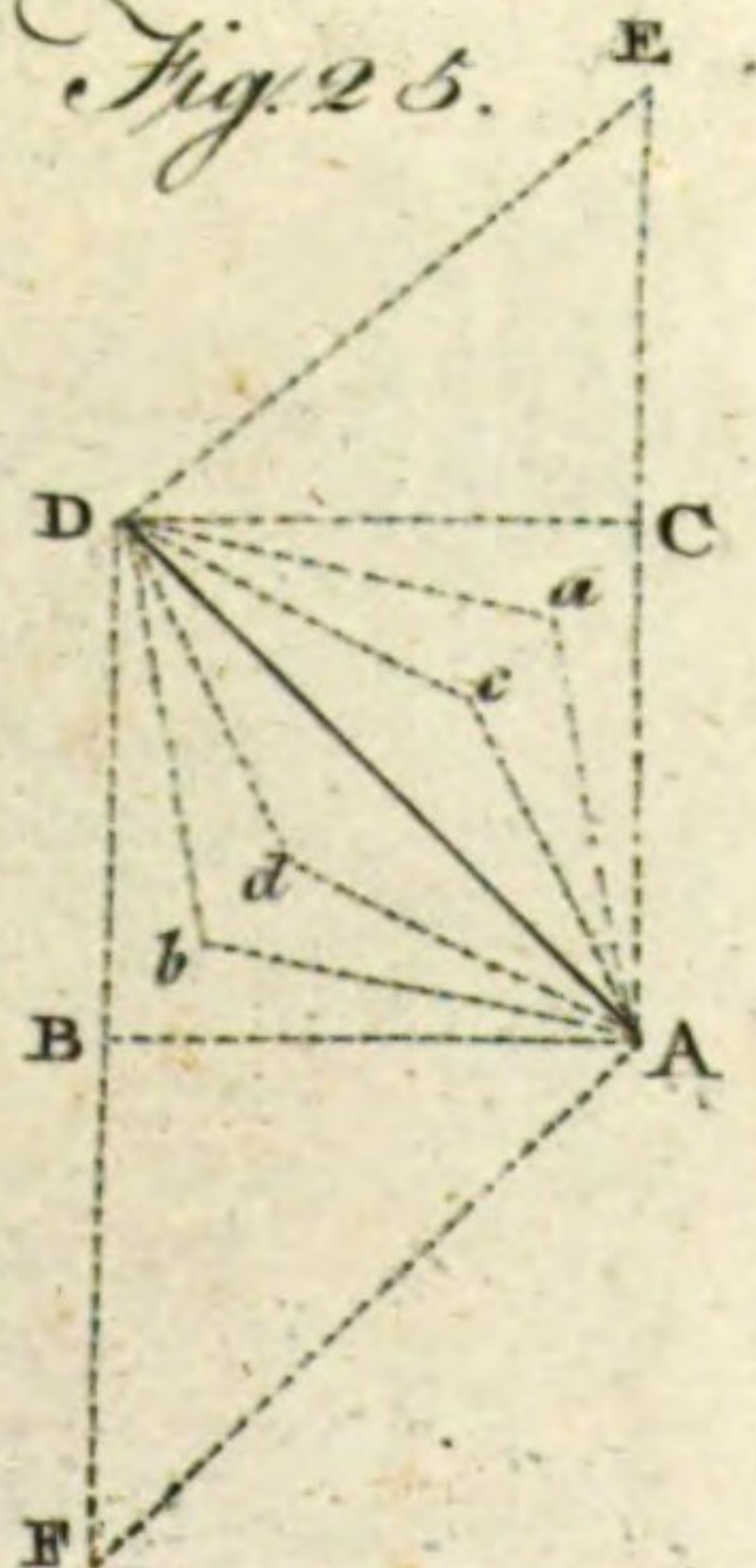


Fig. 20.

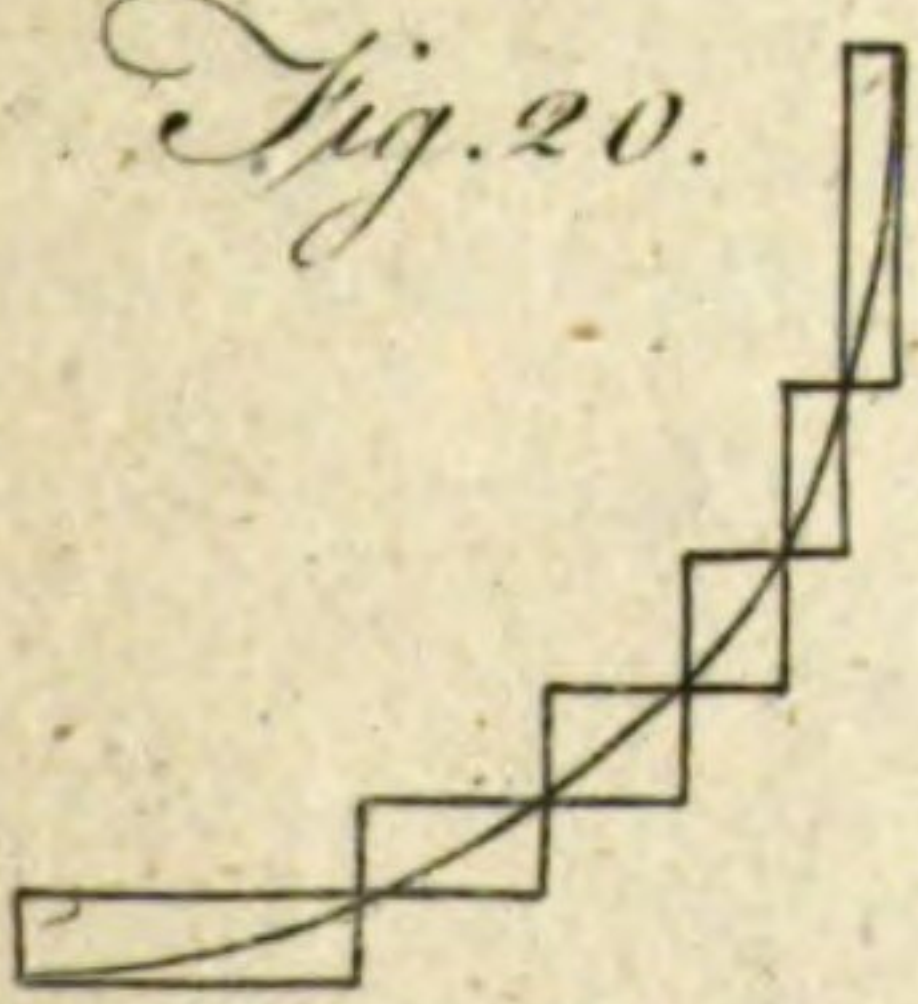


Fig. 26.

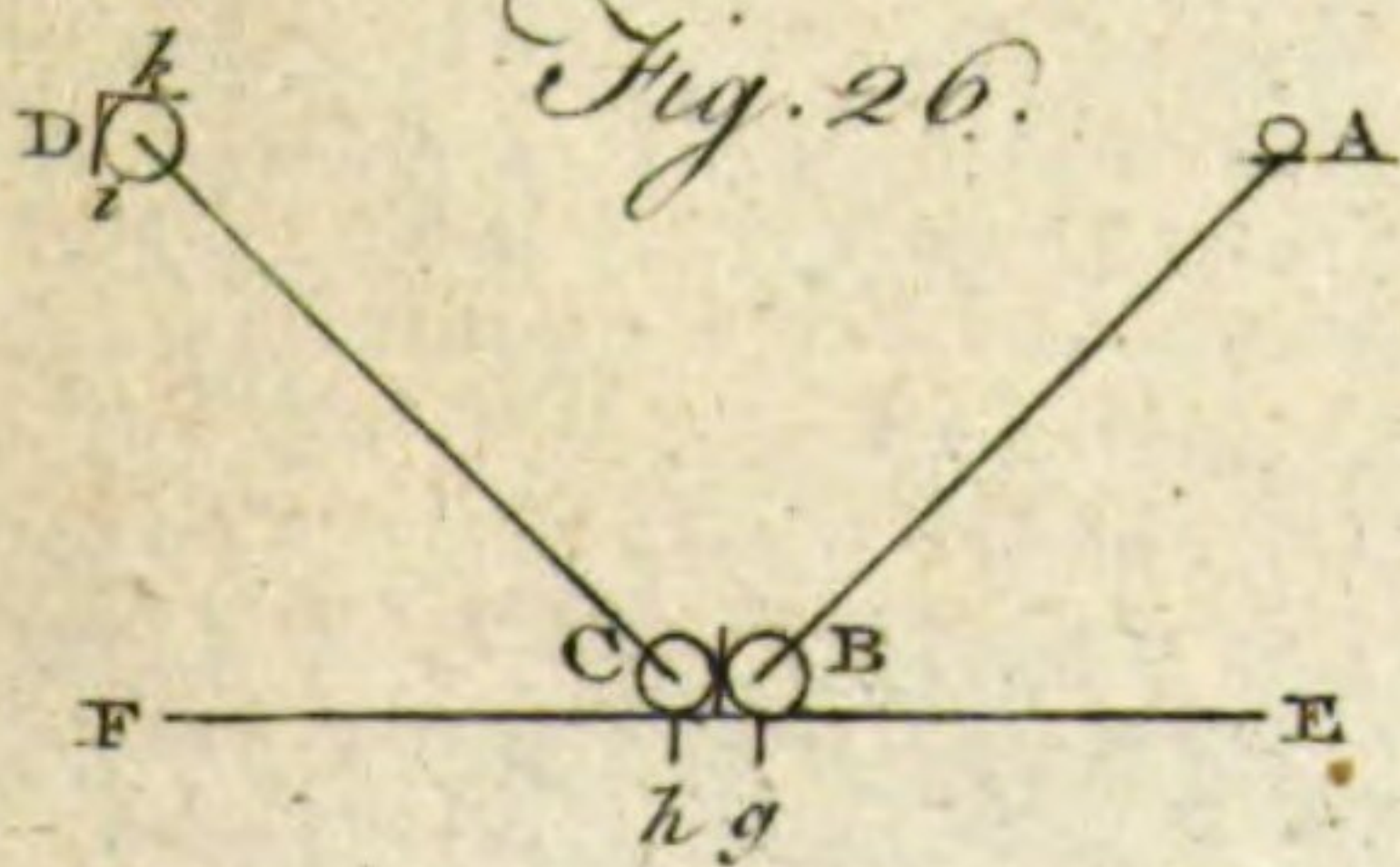


Fig. 27.

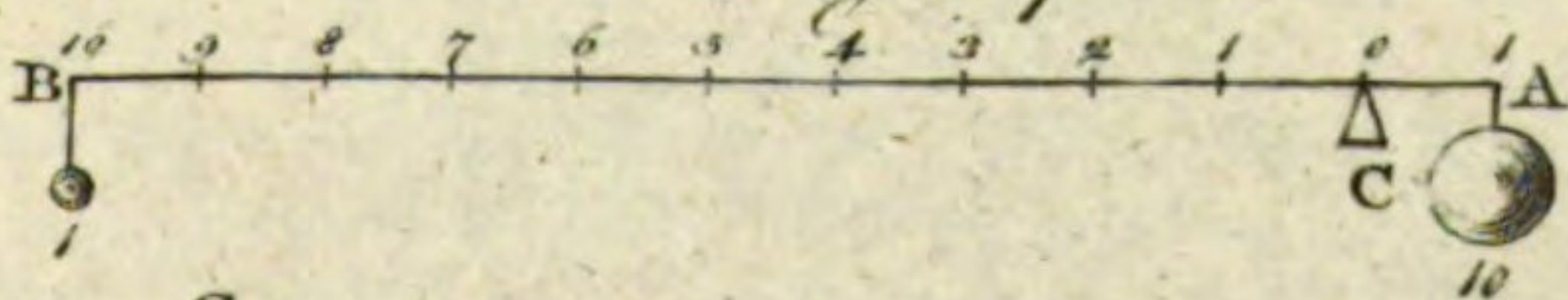
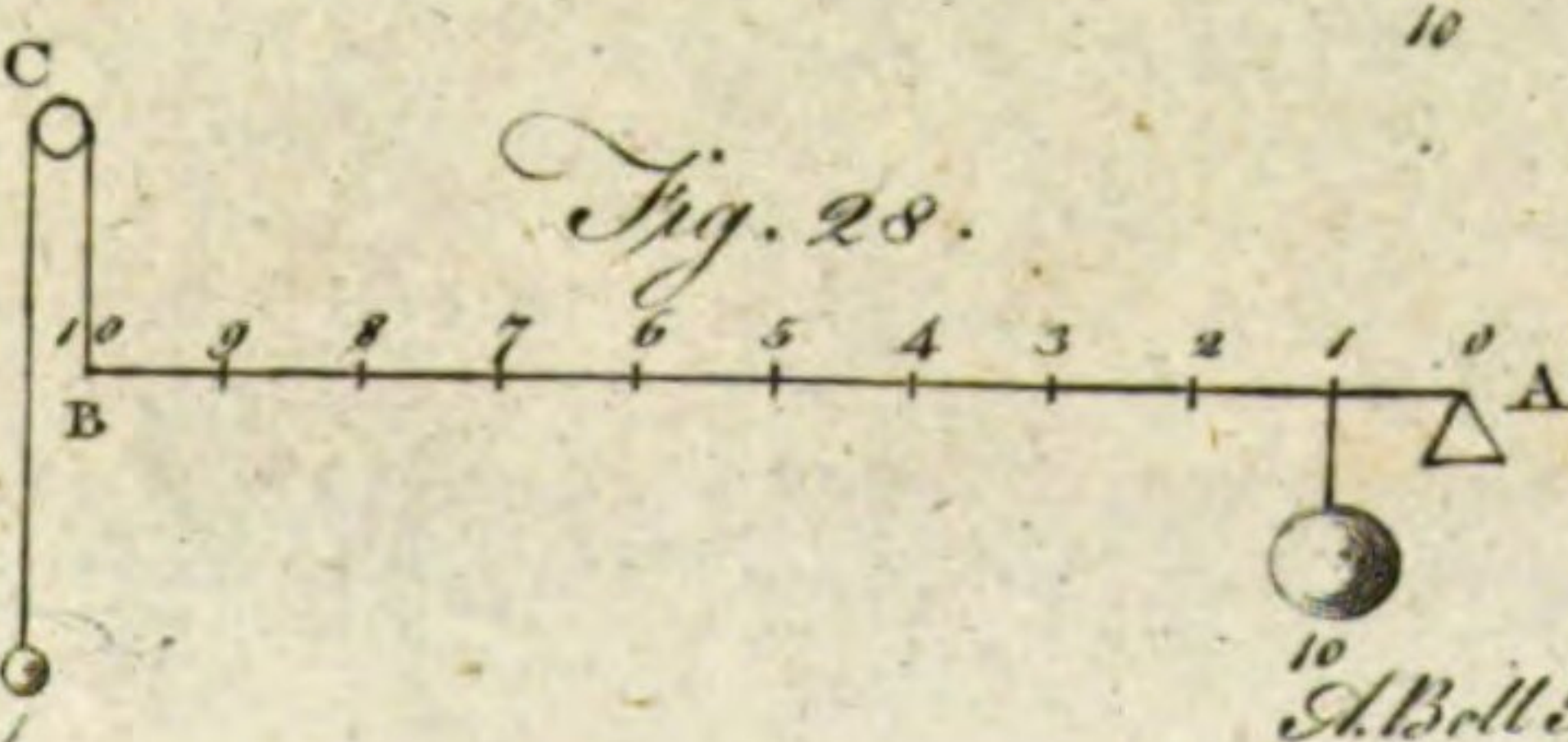


Fig. 28.



Mechanical Powers. of the arm AB will just counterpoise an equal weight E by means of the string CDE put over the pin D, and drawn laterally by the arm AC. But if, as in fig. 32. the fulcrum be placed nearer to the extremity of the arm AC, as at 3, the case will then be very much altered, and one pound suspended at the extremity B of the arm AB will counterpoise four at the extremity C of the other arm; the pressure on the fulcrum will likewise be equal to the weight to be raised. Was the fulcrum placed at 2, then a weight of one pound at B would only counterpoise two pounds acting at C; and if it was placed at 1, then a weight of three pounds at B would be requisite to counterpoise 4 at C.

21
Levers of the fifth kind cannot be balanced by any other.

It is worth notice, that levers of this kind cannot be exactly counterpoised by the power of straight levers. Thus, in fig. 33. let any weight, as C, be appended to B, the extremity of the arm of the bent lever BA4. Let DE be a straight lever, the force of which we design to oppose to that of the crooked lever. For this purpose let another weight F act upon the extremity D of this straight lever by means of a string put over the pin G. Let the two levers be connected together by means of the string *h*3, and let a piece of wood or iron E4 be put between their two extremities: the two weights being now allowed to act, it is evident that the levers will be pulled in different directions, the string *h*3 will be tightened, and the extremity E of the straight lever DE will be pressed towards 4, while the extremity 4 of the crooked lever will be pressed towards E; by which means the two levers will oppose one another in every point of their action. There is not, however, any weight whatever applied to the straight lever which can be made to counterbalance that at C, in such a manner as to keep the bent lever steady. Let us first suppose the weights to be each one pound, and the string to be placed as in the figure at *h*3. In this case the weight C pulls the crooked lever from *h* towards 3, with a force equal to 4, and the extremity 4 will be pressed towards E with an equal degree of force. But in the straight lever, though the point *h* be pulled in the direction 3*h* by a force of four pounds, the extremity E is pressed the contrary way by a force equivalent only to three. Thus the weight C must preponderate, and that at F will ascend. Let us next add to the weight F one third of a pound; by which means the pressure from E towards 4 will be augmented to 4, and the two extremities of the levers will counteract each other: but now the pressure in the direction 3*h* will be greater by one-third of a pound than it is in the direction *h*3; and of consequence the weight F will prevail, the arm AB of the crooked lever and the weight appended to it being raised. If we attempt to mend matters by augmenting the weight F by not quite a third part, the extremities of the two levers will not balance each other, the pressure from 4 to E will be greater than from E to 4; and in like manner the pressure from 3 to *h* will be greater than from *h* to 3. Hence both levers will be pulled in a direction from D towards G, and the weight F will descend if the weights be properly adjusted without any ascent of the other. In short, let us alter the weights as we will, or let us alter the position of the fulcrum as we will, it is easy to see that there is an absolute impossibility that the two levers can counteract each other;

because the pressure upon the fulcrum of the crooked lever will always be equal to that by its extremity 4; but in the straight lever the pressure upon the fulcrum must necessarily be greater than that of the extremity.

These are all the varieties of the lever which can be supposed; it remains now only to show the reason of its action, or why a small weight when at rest should counterpoise a great one; motion or velocity being here to appearance out of the question, as we cannot attribute any degree of motion to two bodies absolutely at rest. To do this in a clear and distinct manner has puzzled some of the greatest mathematicians: that of Dr Hamilton professor of philosophy in Dublin, founded upon the resolution of forces, seems to be the most readily understood, and least liable to objection. 'The most noted theorem in mechanics (says he) is this, "When two heavy bodies counterpoise each other by means of any machine, and are then made to move together, the quantities of motion with which one descends and the other ascends perpendicularly will be equal." An equilibrium always accompanying this equality of motions, bears such a resemblance to the case wherein two moving bodies stop each other when they meet together with equal quantities of motion, that many writers have thought that the cause of an equilibrium in the several machines might be immediately assigned, by saying, that since one body always loses as much motion as it communicates to another, two heavy bodies counteracting each other must continue at rest, when they are so circumstanced that one cannot descend without causing the other to ascend at the same time, and with the same quantity of motion. For then, should one of them begin to descend, it must instantly lose its whole motion by communicating it to the other. This argument, however plausible it may seem, I think is by no means satisfactory; for when we say that one body communicates its motion to another, we must necessarily suppose the motion to exist first in the one, and then in the other; but in the present case, where the two bodies are so connected that one cannot possibly begin to move before the other, the descending body cannot be said to communicate its motion to the other, and thereby make it ascend: But whatever we should suppose causes one body to descend, must be also the immediate cause of the other's ascending: since from the connection of the bodies, it must act upon them both together as if they were really but one. And therefore, without contradicting the laws of motion, I might suppose the superior weight of the heavier body, which is in itself more than able to sustain the lighter, would overcome the lighter, and cause it to ascend with the same quantity of motion with which the heavier descends; especially as both their motions, taken together, may be less than what the difference of the weights, which is here supposed to be the moving force, would be able to produce in a body falling freely.

However, as the theorem above-mentioned is a very elegant one, it ought certainly to be taken notice of in every treatise of mechanics, and may serve as a very good index of an equilibrium in all machines: but I do not think that we can from thence, or from any one general principle, explain the nature and effects of all the mechanic powers in a satisfactory manner.

22
Dr Hamilton's demonstration of the properties of the lever.

Mechanical Powers.

Mechanical Powers.

manner; because some of these machines differ very much from others in their structures, and the true reason of the efficacy of each of them is best derived from its particular structure.

'The lever is considered as an inflexible line, void of weight, and moveable about a fixed point called its *fulcrum* or prop. The property of the lever, expressed in the most general term, is this: "When two weights, or any two forces, act against each other on the arms of a lever, and are in equilibrio, they will be to each other inversely as the perpendicular or shortest distances of their lines of direction from the fulcrum."

'This proposition contains two cases; for the directions of the forces may either meet in a point, or be parallel to each other. Most writers begin their demonstration of this proposition with the second case, which seems to be the simplest, and from which the other may be deduced by the resolution of forces. Archimedes, in his demonstration, sets out with a supposition, the truth of which may reasonably be doubted: for he supposes, that if a number of equal weights be suspended from the arm of a lever, and at points equidistant from each other, whether all these points be at the same side of the fulcrum, or some of them on the opposite side, these weights will have the same force to turn the lever as they would have were they all united and suspended from a point which lies in the middle between all the points of suspension, and may be considered as the common centre of gravity of all the separate weights. Mr Huygens, in his *Miscellaneous observations on mechanics*, says, that some mathematicians have endeavoured, by altering the form of this demonstration, to render its defects less sensible; though without success. He therefore proposed another proof, which is extremely tedious and prolix, and also depends on a postulum, that, I think, ought not to be granted on this occasion: it is this; "When two equal bodies are placed on the arms of a lever, that which is furthest from the fulcrum will prevail and raise the other up." Now, this is taking it for granted, in other words, that a small weight placed further from the fulcrum, will sustain or raise a greater one. The cause and reason of which fact must be derived from the demonstration that follows, and therefore this demonstration ought not to be founded on the supposed self-evidence of what is partly the thing to be proved.

'Sir Isaac Newton's demonstration of this proposition is indeed very concise; but it depends on this supposition, that when from the fulcrum of a lever several arms or radii issue out in different directions, all lying in the same vertical plane, a given weight will have the same power to turn the lever from which-ever arm it hangs, provided the distance of its line of direction from the fulcrum remains the same. Now it must appear difficult to admit this supposition, when we consider that the weight can exert its whole force to turn the lever only on that arm which is the shortest, and is parallel to the horizon, and on which it acts perpendicularly; and that the force which it exerts, or with which it acts perpendicularly, on any one of the oblique arms, must be inversely as the length of that arm, which is evident from the resolution of forces.

N^o 199.

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'Mr Maclaurin, in his *View of Newton's Philosophy*, after giving us the methods by which Archimedes and Newton prove the property of the lever, proposes one of his own, which, he says, appears to be the most natural one for this purpose. From equal bodies, sustaining each other at equal distances from the fulcrum, he shows us how to infer that a body of one pound (for instance) will sustain another of two pounds at half its distance from the fulcrum; and from thence that it will sustain one of three pounds at a third part of its distance from the fulcrum: and going on thus, he deduces, by a kind of induction, what the proportion is in general between two bodies that sustain each other on the arms of a lever. But this argument, were it otherwise satisfactory, yet as it cannot be applied when the arms of the lever are incommensurable, it cannot conclude generally, and therefore is imperfect.

'There are some writers on mechanics, who, from the composition of forces, demonstrate that case of the general proposition relating to the lever, in which the directions of the forces are oblique to each other, and meet in a point: but I do not find that they have had any other way of proving the second case, in which the directions of the forces are parallel, but by considering these directions as making an angle with each other, though an infinitely small one, or as meeting at an infinite distance; which way of reasoning is not to be admitted in subjects of this kind, where the proof should always show us, directly from the laws of motion, why the conclusion must be true, in such manner that we might see clearly the force of every step from the first principles down to the conclusion, which we are prevented from doing when any such arbitrary and inconsistent supposition is introduced.

'From thus considering the various proofs that have been given of this fundamental proposition in mechanics, we may see the reason why many subsequent writers have appeared dissatisfied with the former demonstrations, and have looked for new ones: I shall now propose two methods of demonstrating it, merely from the composition and resolution of forces. The proposition may be expressed as follows.

"When three forces act upon an inflexible line, whether straight or crooked, and keep it in equilibrio, any two of them will be to each other inversely as the perpendicular distances of their lines of direction from that point to which the third force is applied."

'Let the three forces E, G, F, (fig. 34.) act upon three points A, B, D, in an inflexible line; and first let the directions of the forces E and F (which act on the same side of the line) meet in the point C. Then it is evident that the force, which is compounded of these two, must act upon the line A B D in the direction of a right line that passeth through the point C; consequently the force G, which sustains this compounded force, must be equal thereunto, and must act in a contrary direction; therefore the force G must act in the direction of the line C B. From the point B draw B H and B K perpendicular to the directions of the forces E and F, and draw B M and B N parallel to these directions, forming the parallelogram B M C N; then, since these three forces are

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are in equilibrio, they must be to each other respectively as the sides and diagonal of this parallelogram to which their directions are parallel; therefore E is to F as CM to CN or MB, that is, (because the sides of a triangle are as the sines of the opposite angles) as the sine of the angle MBC, or its alternate one BCN, to the sine of the angle BCM; but making CB the radius, BK is the sine of the former angle, and BH of the latter; therefore E is to F as BK to BH; so that the forces E and F are to each other inversely as the perpendicular distances of their lines of direction from the point B, on which the third force G acts. Now to compare the forces F and G together: From the point A, on which the third force acts, draw AB and AL perpendicular to the directions of the forces G and F; then, as was said before, F is to G as MB is to CB; but MB is to CB as AB to AL; because, making CA the radius, AB is the sine of the angle MCB, and AL is the sine of the angle MCN, or CMB its supplement, to two right ones; therefore the forces F and G are to each other inversely as the perpendicular distances of their lines of direction from the point A, on which the third force E acts; and thus the first case of the proposition is proved, in which the forces act against each other in oblique directions.

We must now consider what parts of the forces E and F act against the force G in directions parallel to GC; for it is such parts only that really oppose the force G, and keep it in equilibrio; and from thence we shall see what proportion two forces must have to each other when they are in equilibrio, and act in parallel directions. Let the three forces act upon the points A, B, and D, (fig. 35.); let them be in equilibrio, and their lines of direction meet in the point C, as in the preceding case; then, if the points A, B, and D, are not in a right line, draw the line AD meeting BC in P, and from P draw PN and PM parallel to the directions of the forces E and F; through the points A and D draw parallel lines to BC; and through B draw a perpendicular to these lines, meeting them in H and K; from the point M draw MO parallel to AD, and meeting BC in O. Now the three forces E, G, and F, that are in equilibrio, will be to each other respectively as the sides of the triangle CMP, as in the preceding case; but the force E, which is denoted by the line MC, may be resolved into two forces acting in the directions MO and OC, the former of these only urges the point A towards D, and the latter acts in direct opposition to the force G; in like manner the force F, which is denoted by the line PM, may be resolved into two forces acting in the directions OM and PO, the former of which only urges the point D towards A, and the latter acts in direct opposition to the force G; now it is evident that the force G, which is denoted by the line PC, is sustained only by those parts of the forces E and F which act against it, in directions parallel to BC, and are denoted by the lines OC and PO, which, taken together, are equal to PC; for the other parts of the forces E and F, which are denoted by MO, are lost, being equal, and contrary to each other: if, therefore, instead of the forces F and E, we suppose two other forces, R and L, to act on the points D and A, in directions parallel to BC, and to keep the force G in equilibrio, it follows, from what has

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been proved, that R and L taken together will be equal to G, and that these three forces will be to each other respectively as the lines PO, OC, and PC; therefore R will be to L as PO to OC, (that is, as AM to MC, or as AP to PD, or) HB to BK; consequently the forces R and L are to each other inversely as the perpendicular distances of their lines of direction from the point B, to which the third force is applied. Now to compare the forces R and G together; since the forces R and L may be denoted by BH and BK, and are both together equal to G, that force will be denoted by the whole line KH, and therefore R will be to G as BH to KH; so that these forces are also to each other inversely as the perpendicular distances of their lines of direction from the line of direction of the third force L; and thus the second case of the proposition is proved, in which the forces act against each other in parallel directions. If the point in the inflexible line, to which one of the forces is applied, should become a fixed point, or *fulcrum*, round which the line may turn, it is evident that the other two forces will continue in equilibrio, as they were before; and therefore the property of the lever, in all cases, is manifestly proved by this proposition.

The centre of gravity of a body is said to be that point which being sustained, or prevented from descending, the body will continue at rest. From hence it follows, that when a body hangs freely from a single point and continues at rest, its centre of gravity will lie perpendicularly under the point of suspension; for in that situation only it will be sustained, and can descend no lower.

From this property, which agrees likewise to the common centre of gravity of two bodies joined together by an inflexible right line, and which may then be considered as one, I shall show that their centre of gravity is a point in the line that joins them together, so situated that the distances of the two bodies from it are to each other inversely as their weights. This theorem concerning the position of the common centre of gravity of two bodies, which is a very noted one in mechanics, I have never seen demonstrated otherwise than by inferring it from the general property of the lever: but I think the method I shall now propose of deducing it directly from the definition of the centre of gravity, is the most concise as well as the most natural, and besides it will afford us a very easy way of demonstrating the property of the lever.

Let the two bodies A and B (fig. 36.) be joined by an inflexible right line passing through their centres of gravity, and let them be suspended from the fixed point or pin at P, by the threads AP and BP, so that they may hang freely in such a position as their joint gravity will give them. When these bodies continue at rest, their common centre of gravity must lie directly under the point of suspension, or in the perpendicular line PL, consequently it must be at the point C, the intersection of the lines PL and AB; the position of which point, in the line AB, will be determined by finding out the proportion between the segments CA and CB. If the inflexible line was not interposed between these bodies, they would move till their threads coincided with the perpendicular line PL; since therefore they are kept asunder by this line, they must urge it with certain forces in opposite directions; and these

5 A

urging

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urging forces must be equal, since the line on which they act continues at rest: and therefore the force with which each body urges the other in the direction of this line, may be denoted by the same letter U, and we may denote the weights of the two bodies respectively by the letters A and B. Now the body A is acted upon by three forces, viz. by its weight A in the direction PC, by the force U with which the other body urges it in the direction CA, and by the reaction of the pin in the direction AP; and since these three forces are in equilibrio, and keep the body at rest, they are to each other respectively as the sides of the triangle PCA; therefore A is to U, as PC to CA. In like manner, the body B is urged by three forces, viz. its weight B in the direction PC, the urging force U in the direction CB, and the reaction of the pin in the direction BP, which forces are to each other as the sides of the triangle PCB; therefore U is to B, as CB to PC; and therefore (*ex aequo perturbate*) A is to B, as CB to CA; consequently the weights of the bodies A and B are to each other directly as their distances from the point C, which lies directly under the point of suspension, and is therefore their common centre of gravity.

When two bodies are connected by an inflexible line, and this line is supported by a prop so that their centre of gravity cannot descend, the bodies must continue to rest, and will be in equilibrio. Therefore it is easy to see how, from the theorem now demonstrated, we may prove the property of the lever in that case where the directions of the forces are parallel; and from thence the other case, in which the directions are oblique to each other, may be deduced by the resolution of forces, as is usually done. And this is the second method by which I said the general property of the lever might be strictly demonstrated.

The lever is the most simple of all the mechanic powers; and to it may be reduced the balance and the *axis in peritrochio*, or axle and wheel: Though I do not consider the balance as a distinct mechanic power, because it is evidently no other than a lever fitted for the particular purpose of comparing the weights of bodies, and does not serve for raising great weights or overcoming resistances as the other machines do.

Though this demonstration will no doubt be abundantly clear to mathematical readers, yet to others less versed in that science its appearance will no doubt be somewhat obscure and perplexed. The following we subjoin as less intricate.

Let AB, fig. 37, represent a straight rod of wood or iron, fastened at the extremity A, at right angles to another piece of the same, and kept steady by two pins C and D. If a weight be put upon the extremity H of the upright rod AH, it will press down that, and along with it the horizontal rod AB, so that every point in the rod will move with the whole force of the weight. Thus, whether we suppose an obstacle to be placed at the extremity B, at the point 2, or at 1, in the horizontal rod AB, it will have exactly the force of the weight placed at H to overcome.—Supposing then that the weight would make the whole descend from A to E in one second; then it is plain that the whole power exerted by the rod in its descent would be expressed by the parallelogram ABEF. But if, instead of supposing the line AB to be the full

length represented in the figure, we suppose it to be only half that length, and cut off at 1, then the power of the weight would be represented by the parallelogram A 1 E 1. Were it still farther shortened, by being cut off at 2, then the power would be represented by the parallelogram A 2 E 2; and each of these parallelograms, however unequal they may be as represented upon paper, would in reality be equal when the experiment was made, because in no case could the weight descend with a greater force than its own. Suppose next the weight to be taken off from H, and put upon B, and the rod AB to be moveable upon the centre A; the whole power of the weight then would be expressed by the triangle ABG, equal to the parallelogram ABEF; but as every point of the lever must bear the whole impulse of the weight as before, it is plain, that as we approach towards the centre, that power is compressed into less and less space. Thus, when the weight has descended from B to G, though the large triangle ABG be equal to the parallelogram ABEF, yet the smaller triangle A 1 1 is equal only to one half of the parallelogram A 1 E 1, which represents the power. The whole power being therefore compressed into half the space, must of necessity be double to what it was in the former case. In like manner, the triangle A 2 b, is only equal to one half of the parallelogram A 2 a b; and this parallelogram itself is only half the space representing the whole power of the weight. In this case, therefore, the power is confined within one fourth part of the space which it naturally has, and for that reason must be four times as great.

§ 2. Of the Wheel and Axle, or Axis in Peritrochio.

This power acts entirely on the principles of the lever, and has therefore sometimes been called a perpetual lever. In it the power is applied to the circumference of a wheel by means of a rope or otherwise, the weight to be raised being fastened to a rope which winds round the axis. It is represented fig. 38, where AB is the wheel, EDF its axis, P the moving power, and W the weight to be raised by means of the rope K coiling itself about the axis. It is plain then from an inspection of the figure, that when the large wheel has made one revolution, the weight P will have descended through a space equal to the circumference, and as much of the cord I, by which it is suspended, will be wound off. On the other hand, the weight W will have ascended only through a space equal to the circumference of the axle, and just so much of the rope K will be wound up upon it. As the circumference of the wheel, therefore, is to that of the axis, so will the velocity of the moving power be to that of the weight to be raised, and of consequence such will be the force of the machine: thus, if the circumference of the wheel be eight, ten, twelve, or any number of times as large as that of the axle, one pound applied to the circumference will counterbalance eight, ten, twelve, or more pounds, applied to the axle, and a small addition will raise it up.

The engines called *cranes*, for raising great weights, are no other than wheels of this kind. Sometimes they are moved by handles S, S, &c. placed on the circumference of the wheel, which is turned by mens hands, as is shown fig. 38. Sometimes the wheel is hollow, and furnished

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powers.

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Another
demonstration.

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Of the engines called
cranes.

Mechanical powers. furnished with steps, on which a man, who is inclosed in the wheel, continually sets his feet, as if he was ascending a stair; and thus the wheel yielding to his weight turns round, and coils up the rope which raises the weight about its axis. When the crane is to be turned by mens hands, it may advantageously have cogs all round the circumference, in which a small trundle may be made to work, and be turned by a winch.— Thus the power of the man who works it will be greatly increased; for his strength will be augmented as many times as the number of revolutions of the winch exceeds that of the axle D, when multiplied by the excess of the length of the winch above the length of the semidiameter of the axle, added to the semidiameter or half the thickness of the rope K, by which the weight is drawn up. Thus, suppose the diameter of the rope and axle taken together to be 12 inches, and consequently half their diameters to be 6 inches, so that the weight W will hang at six inches perpendicular distance from below the centre of the axle; let us suppose the wheel AB, which is fixed on the axle, to have 80 cogs, and to be turned by means of a winch six inches long, fixed on the axis of a trundle of eight staves or rounds, working in the cogs of the wheel. Here it is plain that the winch and trundle would make ten revolutions for one of the wheel AB, and its axis D, on which the rope K winds in raising the weight W: and the winch being no longer than the sum of the semidiameters of the great axle and rope, the trundle could have no more power on the wheel than a man could have by pulling it round by the edge, because the winch would then have no greater velocity than the edge of the wheel has, which is supposed to be ten times the velocity of the rising weight; so that in this case the acquisition of power would be as 10 to 1. But if the length of the winch be 12 inches, the power gained will be as 20 to 1; if 18 inches, which is a sufficient length for any man to work with, the acquisition of power will be as 30 to 1; because the velocity of the handle would be 30 times as great as that of the rising weight, and the absolute force of any machine is exactly in proportion to the velocity of the weight raised by it. We must always remember, whoever, that just as much time is lost in working the machine as there is power gained by it; for none of the mechanical powers are capable of gaining both power and velocity at the same time.

In all cranes, it is necessary to have a racked wheel, represented by G, on one end of the axle, with a catch H to fall into its teeth; which will at any time support the weight, and keep it from descending, if the workman should happen to let slip his hold. For want of this precaution, terrible accidents have sometimes happened to people inclosed in cranes, by their inadvertently missing a step.

§ 3. Of the Pulley.

The pulley is a single wheel of wood, brass, or iron, moveable upon an axis, and inclosed in a kind of case called its *block*, which admits of a rope to pass freely over the circumference of the pulley, in which also there is usually a groove to keep the rope from sliding, the axis being generally fixed in the block.

Mechanical powers. In some pulleys the block is fixed; in others moveable, and rises with the weight. Both these kinds are represented, fig. 39. AA shows a fixed pulley, with its block b. Over the wheel a string BB passes, to the extremities of which are fixed the two weights W and P. This pulley, however, though it changes the direction of a power, yet does not gain any advantage; for one of the weights must always descend as much as the other ascends, of consequence their velocities must always be equal; and when this is the case, there can be neither increase nor decrease of power. A single fixed pulley, therefore, though it may compare the weight of two bodies together, cannot be accounted in any respect a mechanical power. But if with a fixed pulley we combine a moveable one, or one in which the block arises along with the wheel, we gain an increase of one half. Thus if a weight W hangs at the lower end of the moveable block P of the pulley D, and the cord GF goes under the wheel, it is plain that the half G of the cord bears one half of the weight W, and the half F the other. The hook H, therefore, which sustains the half G of the cord, must therefore bear one half of the weight; and if the cord at F be drawn up, so that the pulley may be raised from D to C, the string will be extended to its whole length, all but that which goes under the wheel of the pulley D; but the weight or power P by which the string is thus drawn up, will have moved twice as far as the weight W which is drawn up: whence we see that only one pound at P will be requisite to counterpoise two pounds at W. If the upper and fixed block contain two pulleys, and the lower one U contain also two, the advantage gained by this combination will be as 4 to 1. Thus, if one end of the string KMOQ be fixed to a hook at I, and the string passes over the pulleys N and R, and under those L and P, the weight T of one pound will balance a weight W of four pounds, suspended by a hook from the moveable block, making allowance for the weight of the block itself. In like manner will the pulleys give an advantage of 4 to 1 when disposed as at X and Y; but in all cases the same relation between velocity and power is preserved as in the lever and axis in peritrochio, viz. if the power balances twice its own weight, it must move or have a tendency to move through twice the space; if it balances four times its weight, then it must have a tendency to move through four times the space that the other does.

²⁵ Pulleys are of great use in practical mechanics, as by their means great weights may be raised to any height much more expeditiously than by any other method, and the smallness of their weight makes them very convenient for carriage. At sea they are used for hoisting the sails and yards, straitening ropes, &c. Archimedes, by means of a machine composed of pulleys, is said to have drawn a ship along the strand, in the presence of Hiero king of Syracuse; but this is scarcely to be credited, on account of the great friction which attends this kind of machines.— The friction arises from three causes: 1. The diameter of the axis bearing a considerable proportion to that of the wheels. 2. Their rubbing against their blocks, or against one another. 3. The stiffness of the rope that goes over and under them. All these

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powers.

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Reason of
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ley.

causes must necessarily be augmented, in proportion to the weight we have to overcome: and when we consider the immense resistance which a ship must make, with the strength and stiffness of the ropes necessary to overcome it, we can scarce suppose the strength of any individual equal to the task. Pulleys have often been used by inhuman tyrants, in constructing machines for torturing the objects of their cruelty.

The pulley has by some writers been reduced to the lever as well as the wheel and axis; in which method they consider the fixed pulleys as a lever of the first, and the moveable pulley as one of the second kind: but it is justly observed by Professor Hamilton, that the pulley cannot be with any propriety reduced to a lever; because, though both the moveable and immoveable pulleys should be taken away, the ropes would have to sustain the same weight that they do with the pulleys; nay, the very same advantages would be gained by the mere use of pins, without any wheels, were not the friction very great even upon the smoothest pins that could be made use of. It is, indeed, merely to avoid this resistance on the pins that wheels are made use of at all. The best method of computing the power, and explaining the reason of the effects of pulleys, is by considering that every moveable pulley hangs by two ropes equally stretched, each of which bears one half of the weight; and therefore, when the same rope goes round a number of fixed and moveable pulleys, since all its parts on each side of the pulleys are equally stretched, the whole weight must be equally divided amongst all the ropes by which the moveable pulleys hang; consequently, if the power which acts on one rope be equal to the weight divided by the number of ropes, that power will sustain the weight.

27
Mr White's
patent pul-
ley.

Plate
CCLXXXVII.

A very considerable improvement in the construction of pulleys has been made by Mr James White, who has obtained a patent for his invention, and of which the following description is given by the inventor. Fig. 68 shows the machine, consisting of two pulleys Q and R, one fixed and the other moveable. Each of these has six concentric grooves, capable of having a line put round them, and thus acting like as many different pulleys, having diameters equal to those of the grooves. Supposing then each of the grooves to be a distinct pulley, and that all their diameters were equal, it is evident that if the weight 144 were to be raised by pulling at S till the pulleys touched each other, the first pulley must receive that length of line as many times as there are parts of the line hanging between it and the lower pulley. In the present case, there are 12 lines, b, d, f, &c. hanging between the two pulleys, formed by its revolution about the six upper and six lower grooves. Hence as much line must pass over the uppermost pulley as is equal to twelve times the distance of the two. But, from an inspection of the figure, it is plain, that the second pulley cannot receive the full quantity of line by as much as is equal to the distance betwixt it and the first. In like manner, the third pulley receives less than the first by as much as is the distance between the first and third; and so on to the last, which receives only one twelfth of the whole. For this receives its share of line n from a fixed point in the up-

per frame, which gives it nothing; while all the others Mechanical in the same frame receive the line partly by turning powers. to meet it, and partly by the line coming to meet them.

Supposing now these pulleys to be equal in size, and to move freely as the line determines them, it appears evident, from the nature of the system, that the number of their revolutions, and consequently their velocities, must be in proportion to the number of suspending parts that are between the fixed point above-mentioned and each pulley respectively. Thus the outermost pulley would go twelve times round in the time that the pulley under which the part n of the line, if equal to it, would revolve only once; and the intermediate times and velocities would be a series of arithmetical proportionals, of which, if the first number were 1, the last would always be equal to the whole number of terms. Since then the revolutions of equal and distinct pulleys are measured by their velocities, and that it is possible to find any proportion of velocity on a single body running on a centre, viz. by finding proportionate distances from that centre, it follows, that if the diameters of certain grooves in the same substance be exactly adapted to the above series (the line itself being supposed inelastic, and of no magnitude), the necessity of using several pulleys in each frame will be obviated, and with that some of the inconveniencies to which the use of the pulley is liable.

In the figure referred to, the coils of rope by which the weight is supported are represented by the lines a, b, c , &c.; a is the line of fraction, commonly called the fall, which passes over and under the proper grooves, until it is fastened to the upper frame just above n . In practice, however, the grooves are not arithmetical proportionals, nor can they be so; for the diameter of the rope employed must in all cases be deducted from each term; without which the smaller grooves, to which the said diameter bears a larger proportion than to the larger ones, will tend to rise and fall faster than they, and thus introduce worse defects than those which they were intended to obviate.

The principal advantage of this kind of pulley is, that it destroys lateral friction, and that kind of shaking motion which are so inconvenient in the common pulley. "And lest (says Mr White) this circumstance should give the idea of weakness, I would observe, that to have pins for the pulleys to run on, is not the only nor perhaps the best method; but that I sometimes use centres fixed to the pulleys, and revolving on a very short bearing in the side of the frame, by which strength is increased, and friction very much diminished; for to the last moment the motion of the pulley is perfectly circular: and this very circumstance is the cause of its not wearing out in the centre as soon as it would, assisted by the ever increasing irregularities of a gullied bearing. These pulleys, when well executed, apply to jacks and other machines of that nature with peculiar advantage, both as to the time of going and their own durability; and it is possible to produce a system of pulleys of this kind of six or eight parts only, and adapted to the pockets, which, by means of a skain of sewing silk, or a clue of common thread, will raise upwards of an hundred weight.

MECHANICS.

Plate CCLXXXIV.

Fig. 29.

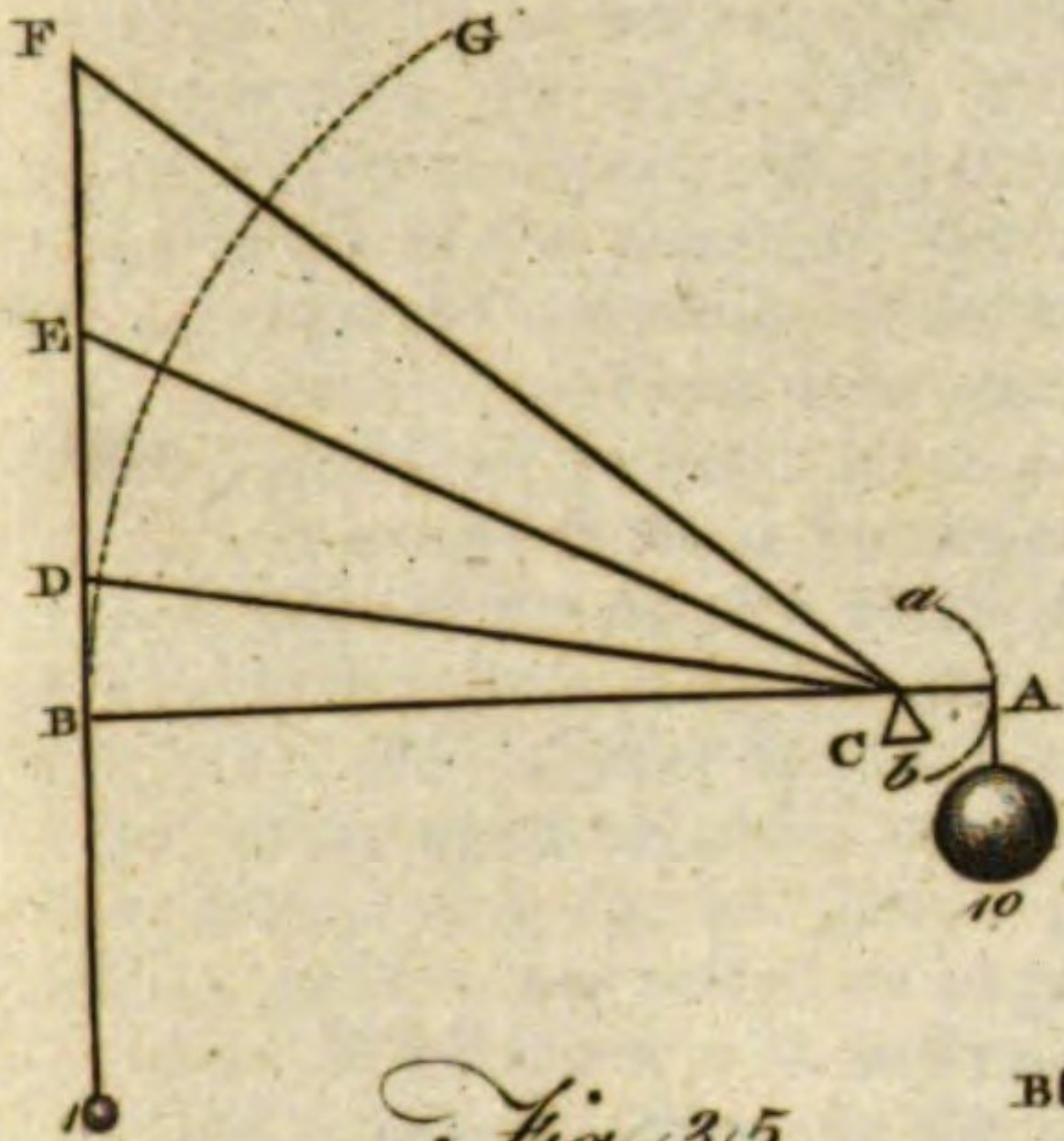


Fig. 30.

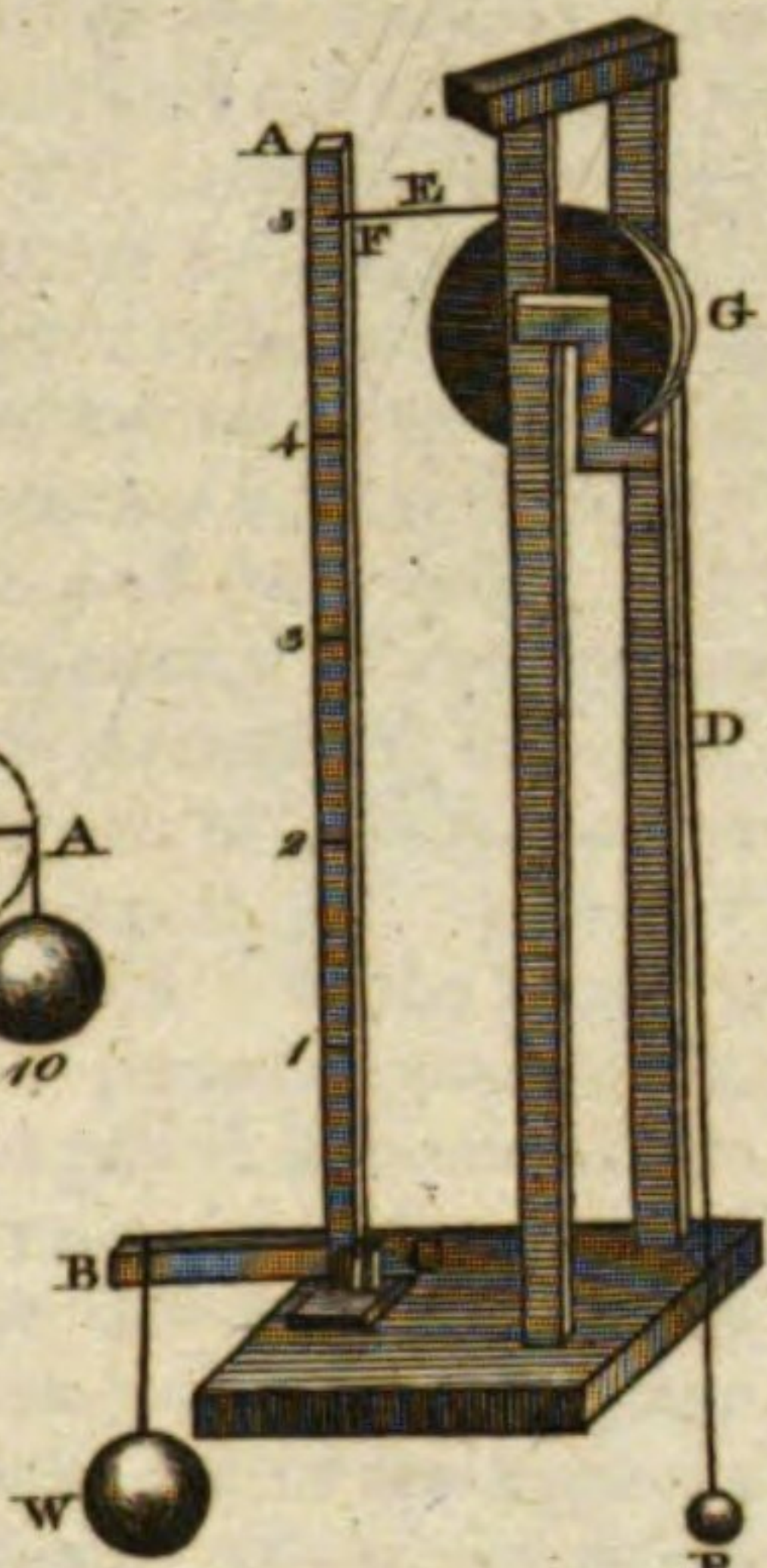


Fig. 31.



Fig. 34.

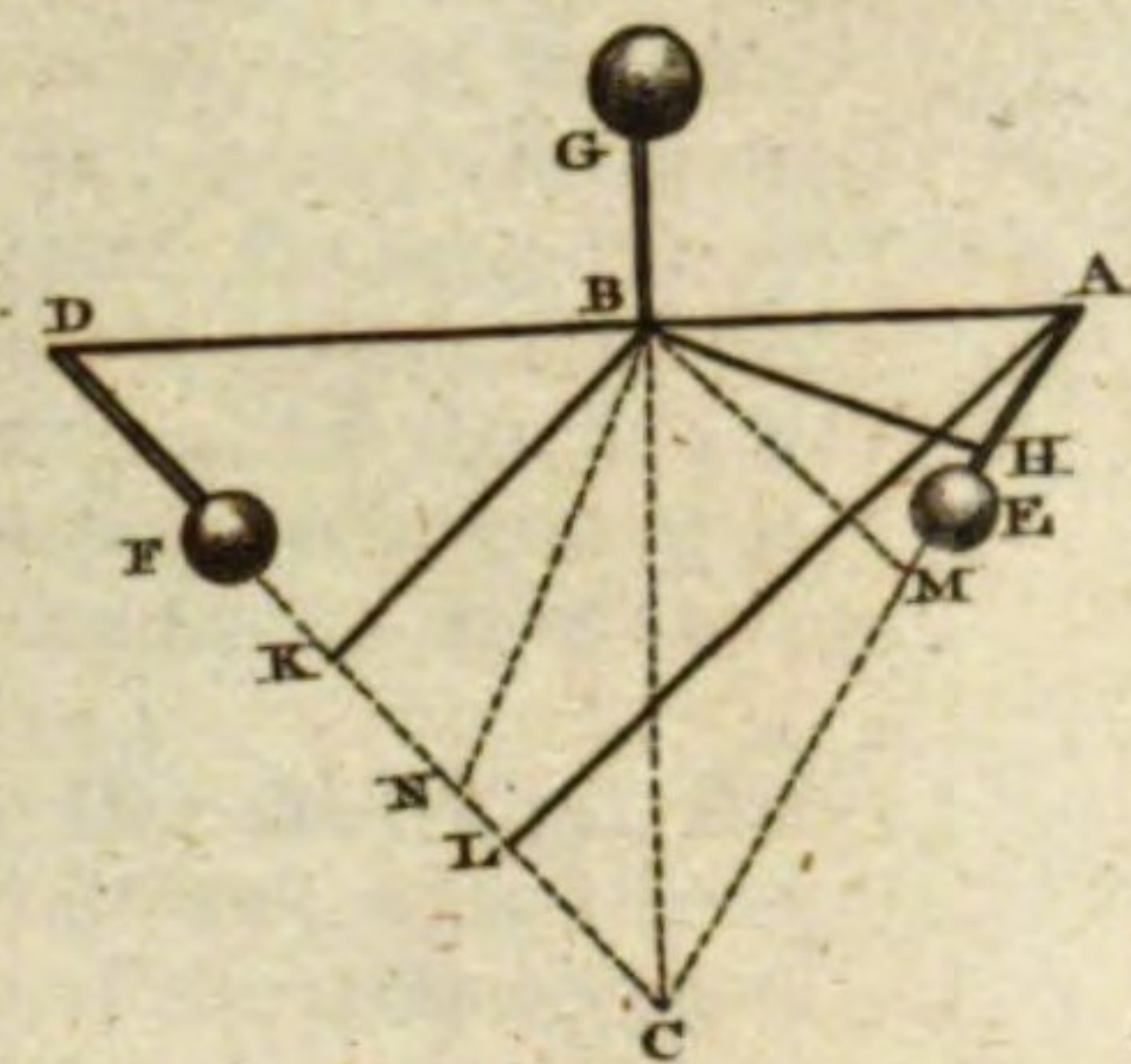


Fig. 35.

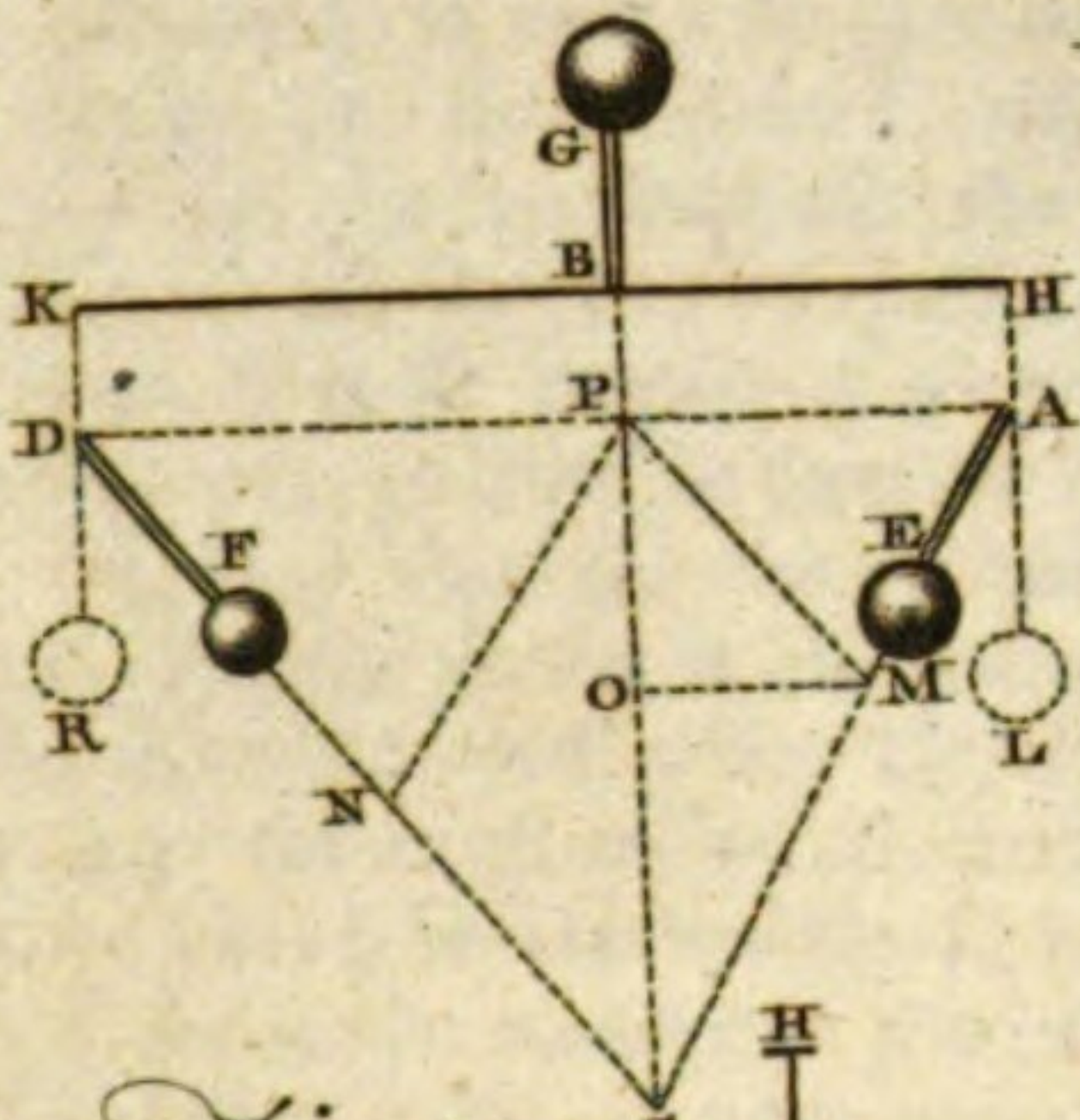


Fig. 36.

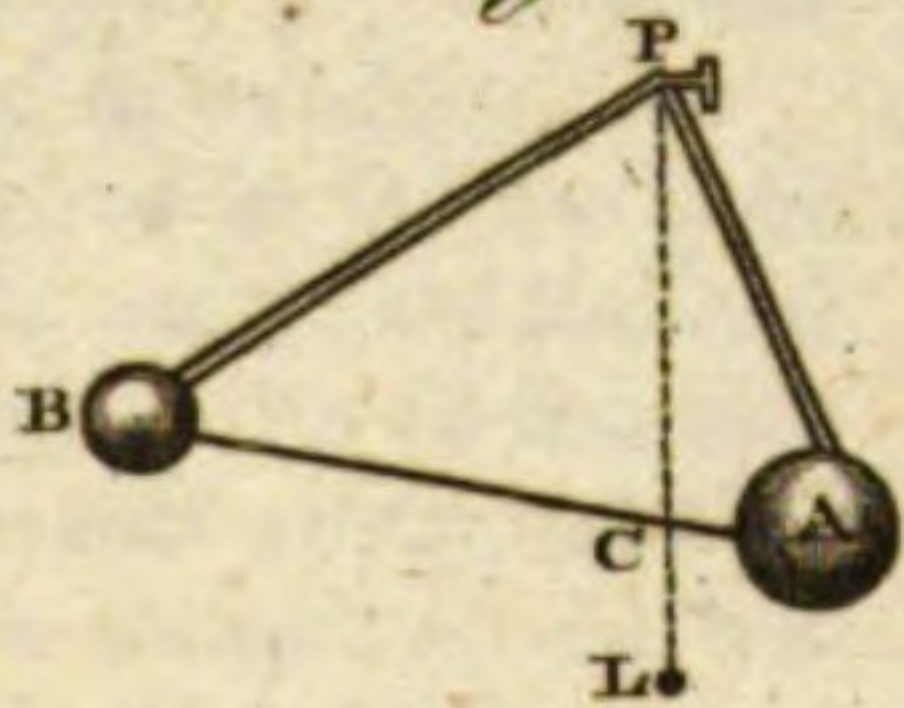


Fig. 32.

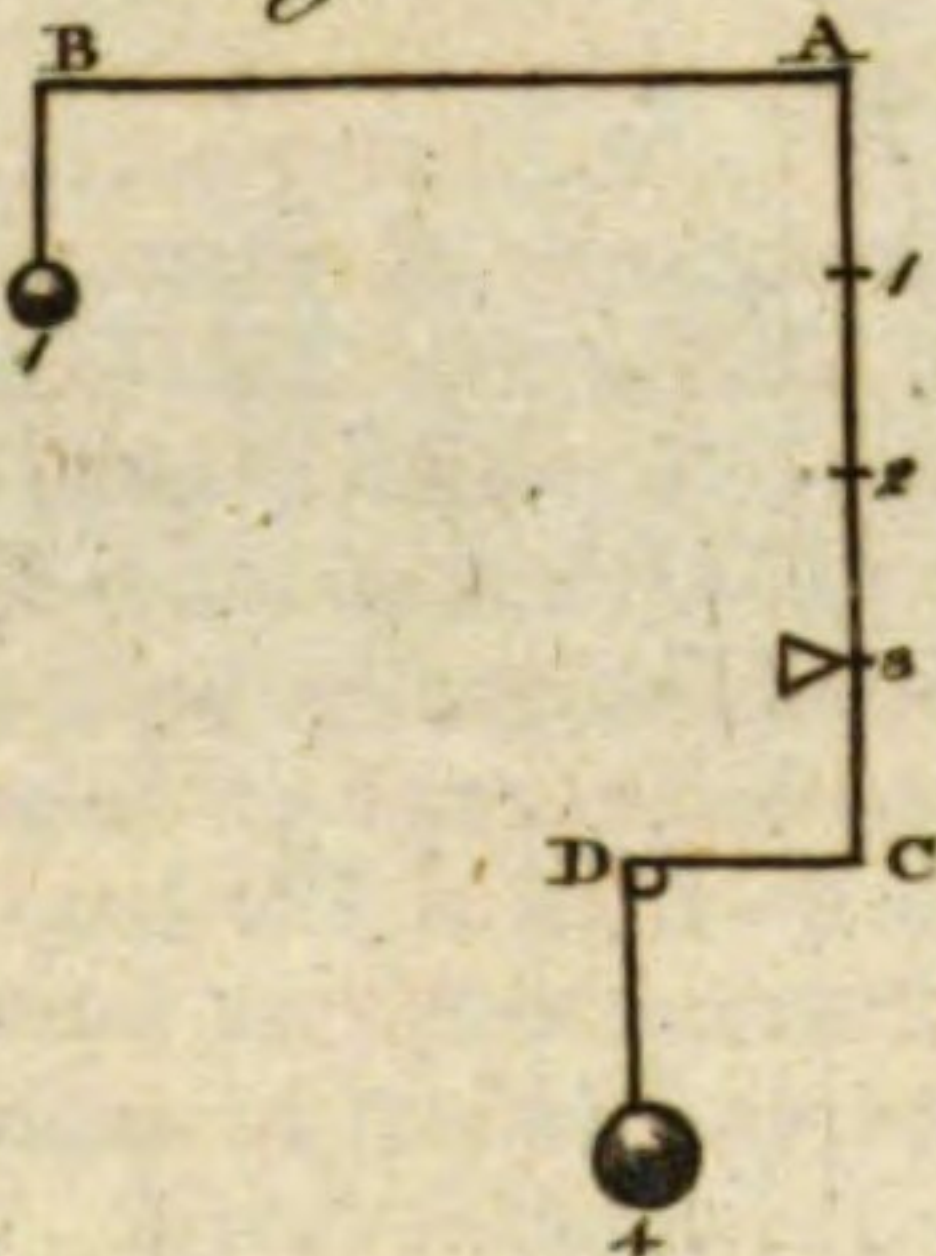


Fig. 33.

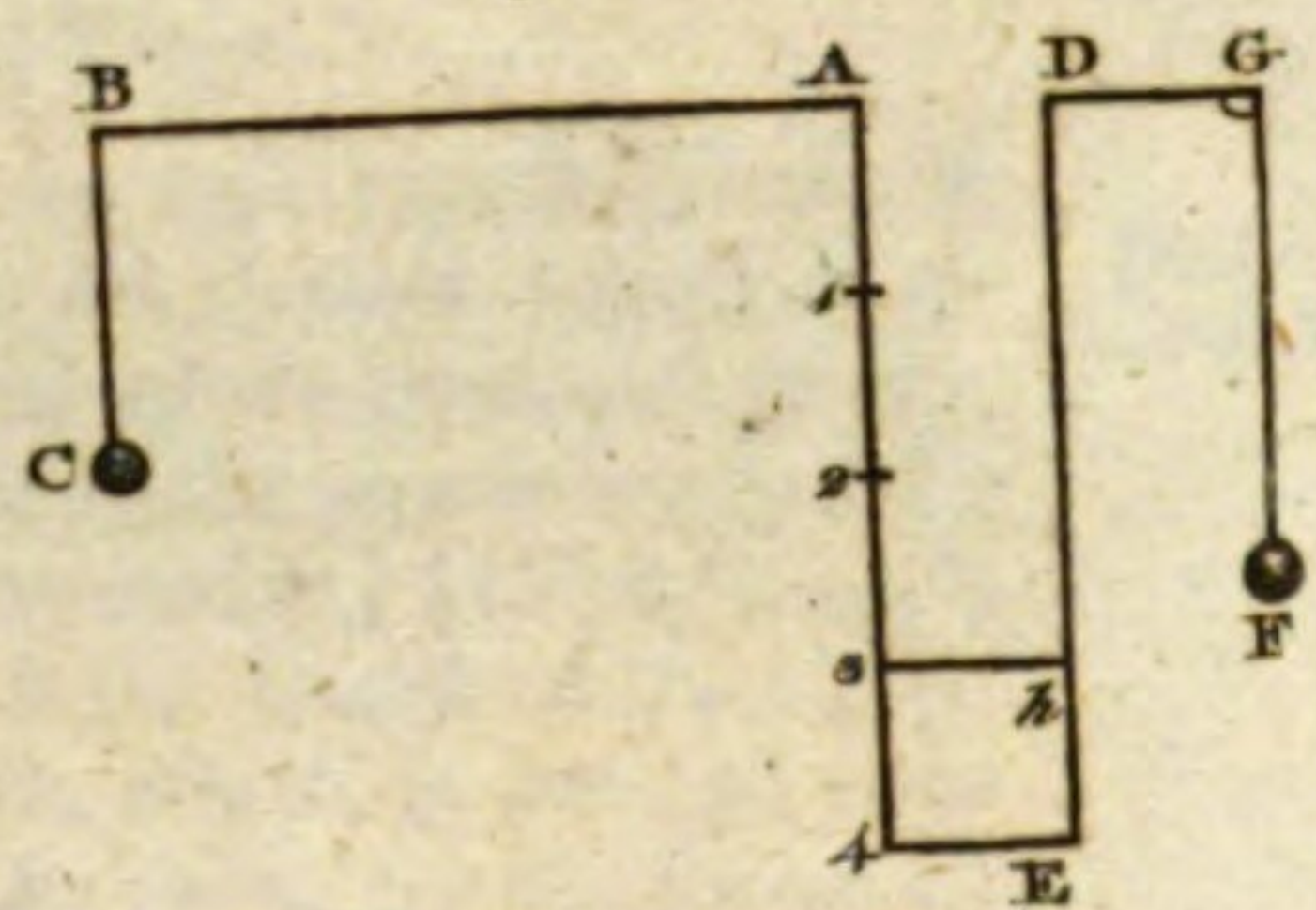


Fig. 41.



Fig. 37.

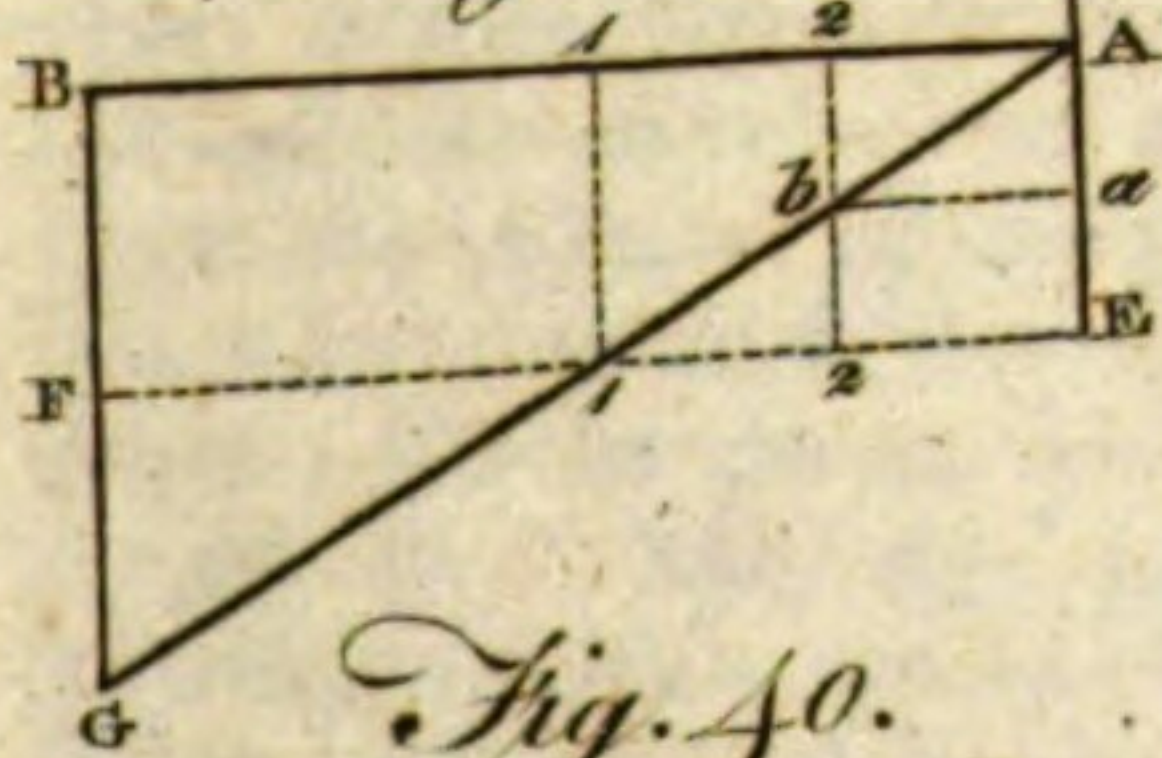


Fig. 38.

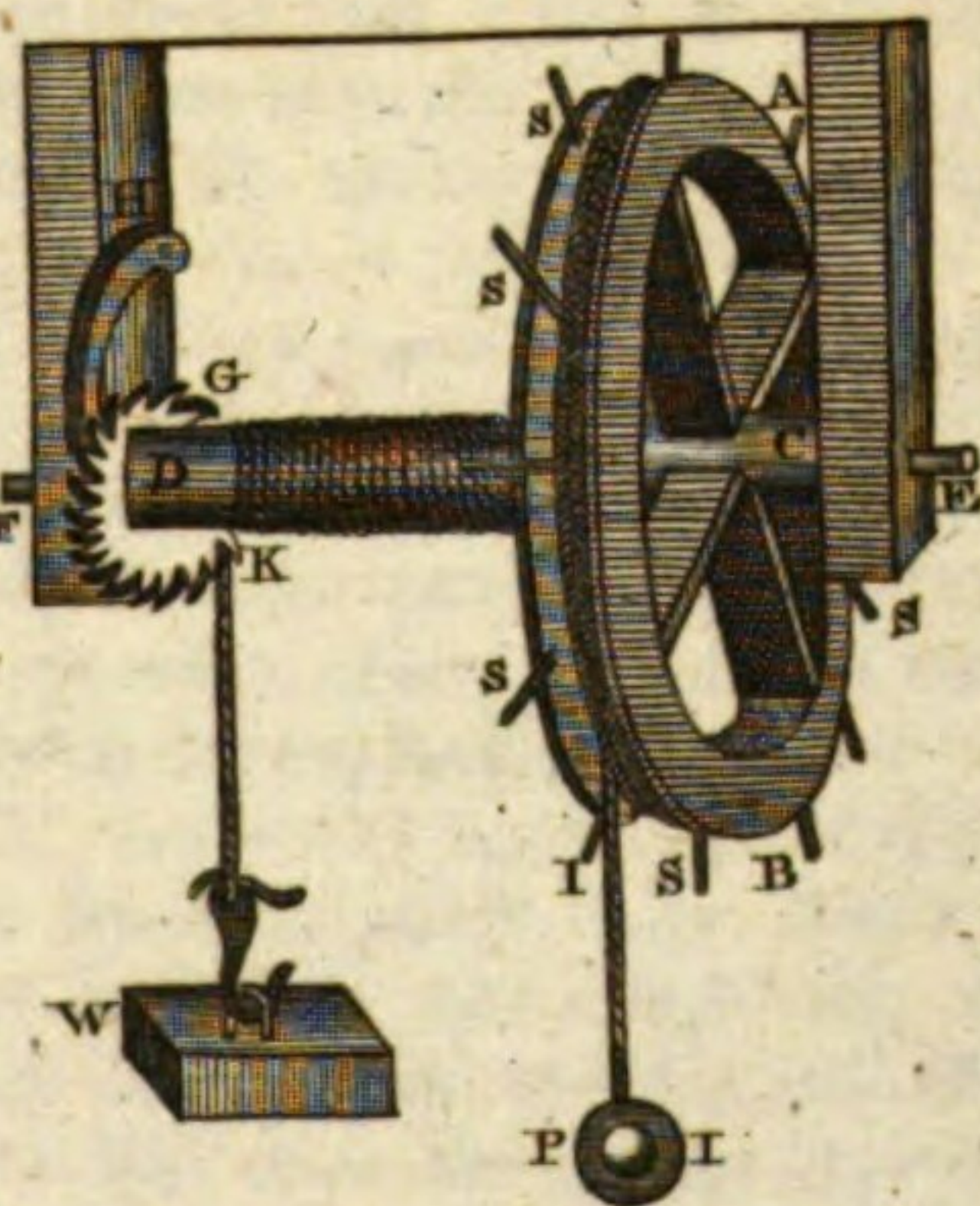


Fig. 39.

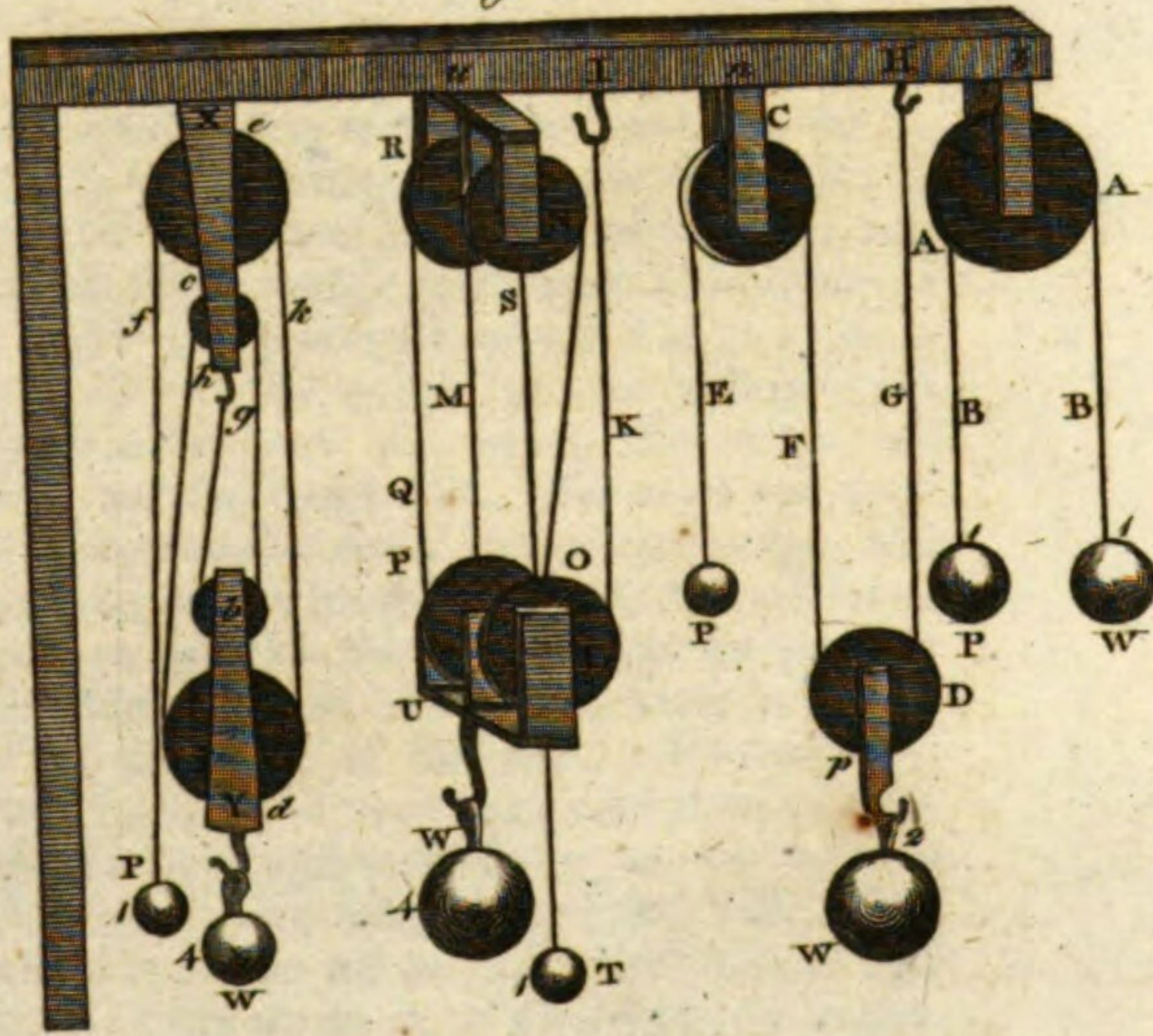


Fig. 40.

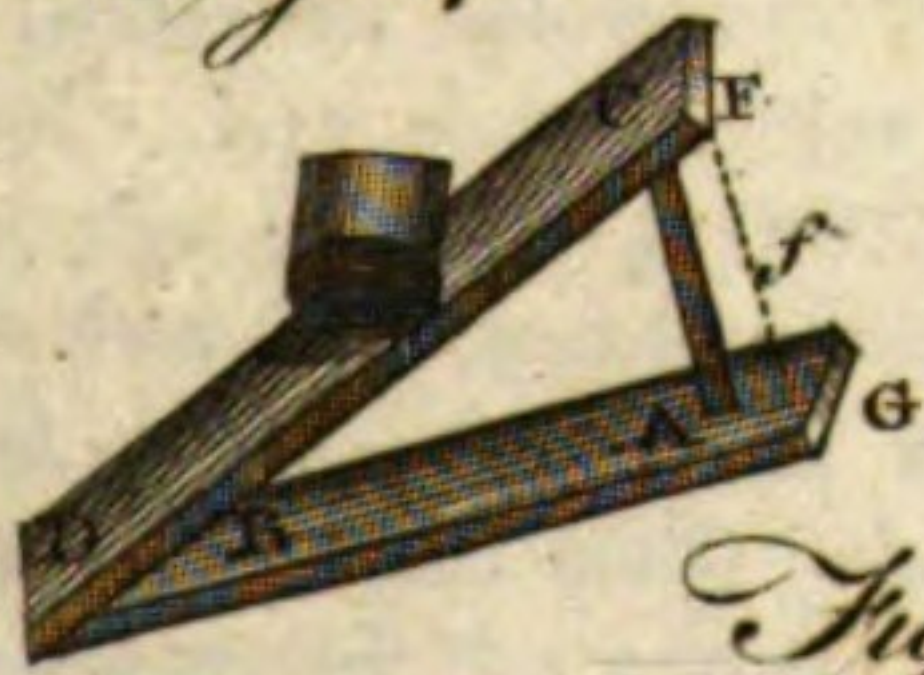


Fig. 43.

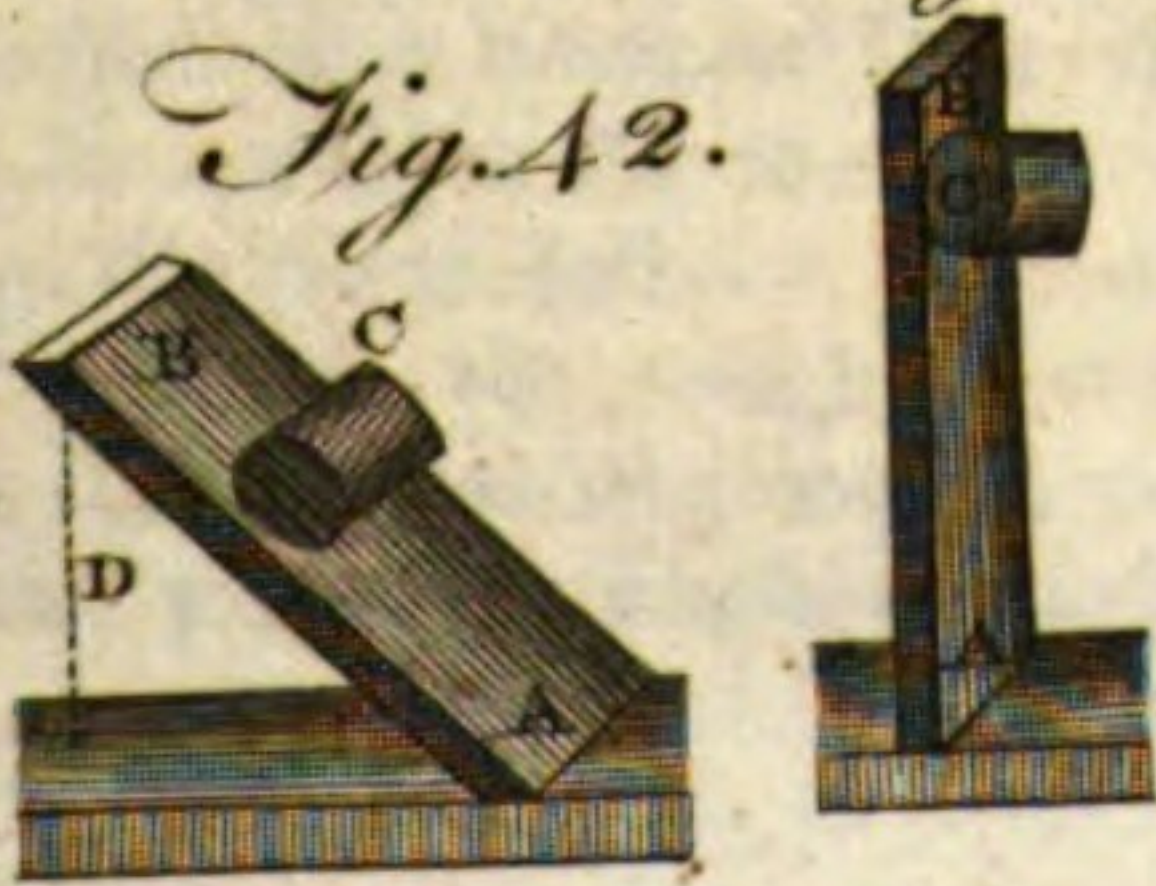


Fig. 44.

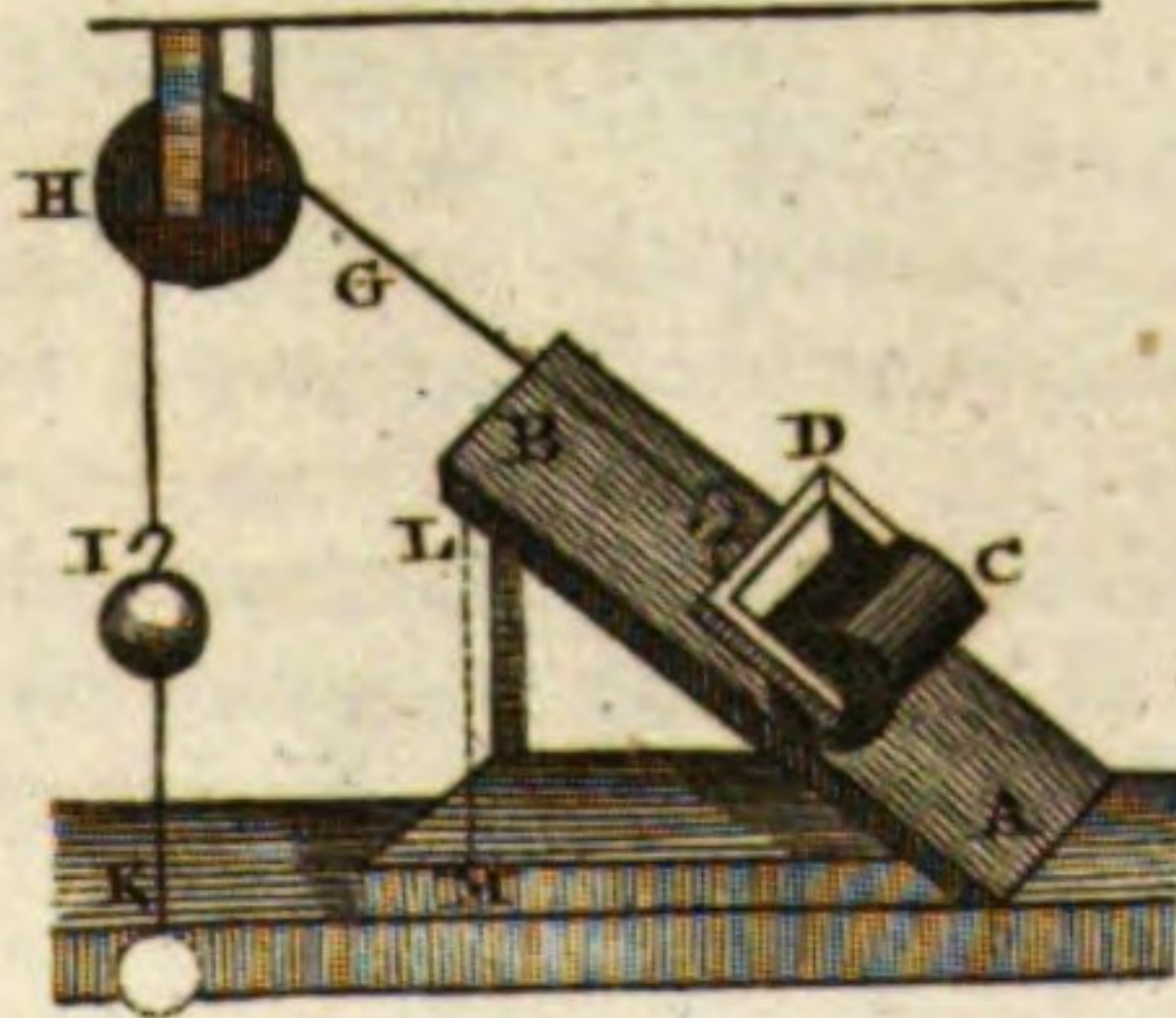
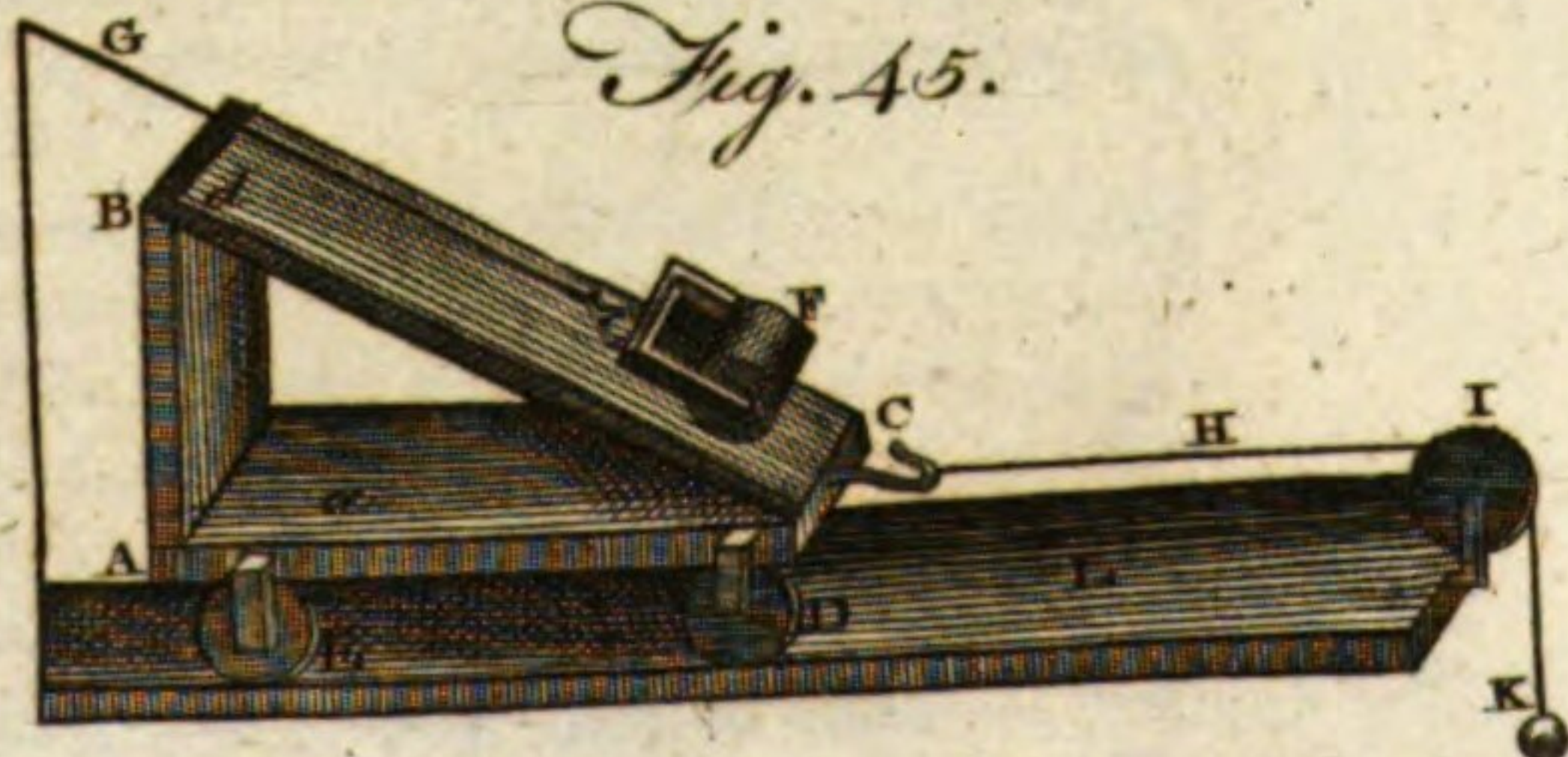
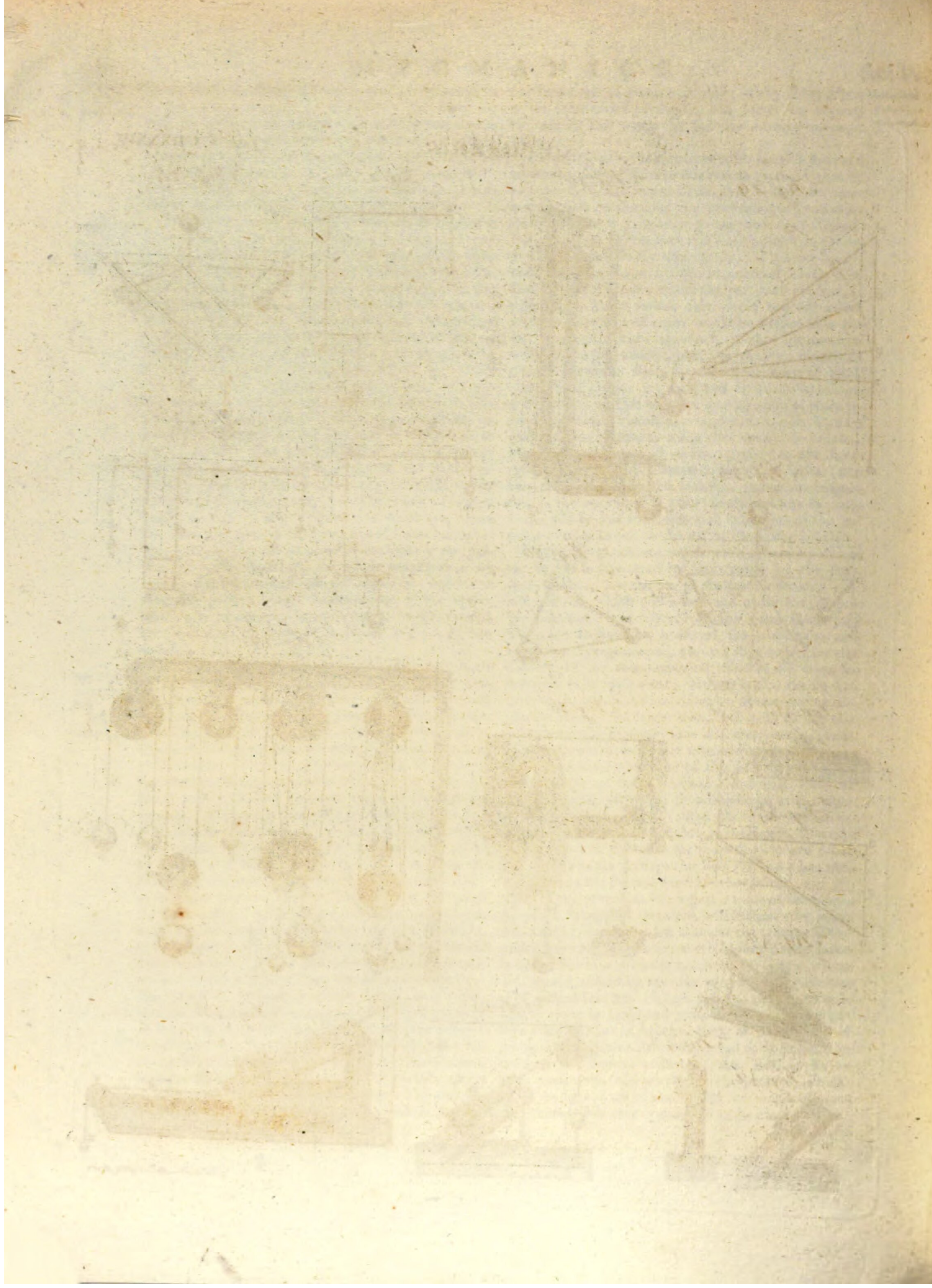


Fig. 45.





§ 4. *Of the Inclined Plane.*

THIS power is represented fig. 40; and the advantage gained by it is exactly in the proportion of the length of the plane to the perpendicular height of it. Thus, let AB be a plane parallel to the horizon, and CD one inclined to it: suppose also the whole length CD to be three times as great as the perpendicular height GfF; in this case, the cylinder E will be supported upon the plane CD, and kept from rolling down upon it, by one-third part of its weight. Were the length of the plane four times its height, it would be prevented from rolling down by one-fourth part of its weight. The force with which a rolling body descends upon an inclined plane will be to that with which it would descend by the power of gravity, as the height of the plane is to the length of it.—For, suppose the plane AB (fig. 41.) to be parallel to the horizon, the cylinder C will keep at rest upon any part of the plane on which it is laid. If the plane be so elevated as in fig. 42. that its perpendicular height D be equal to one half of its length AB, then the cylinder will roll down with half its weight; for it would require a power (acting in the direction AB) equal to half its weight to keep it from rolling. If the plane be elevated so as to be perpendicular to the horizon, as in fig. 43. the cylinder C will descend with its whole force of gravity, because the plane contributes nothing to the support or hinderance of it; for which reason, it must require a power equal to the whole force of its gravity to keep it from descending.

If, as in fig. 44. the cylinder C be made to turn upon slender pivots in the frame D, which is furnished with a hook, with a line G fastened to it; if this line go over the fixed pulley H, and have its other end tied to the hook in the weight I; if the weight of the body I be to the weight of the cylinder C, added to that of its frame D, as the perpendicular height of the plane LM is to its length AB; the weight will just support the cylinder, and a small force will make it either ascend or descend. In the time that the cylinder moves from A to B, it must rise through the whole height of the plane ML, and the weight will descend from H to K, through a space equal to the whole length of the plane AB. If the plane be now made to move upon rollers or wheels as in fig. 45. and the cylinder be supported upon it, the same power will draw the cylinder up the plane, provided the pivots of the wheels be small, and the wheels themselves pretty large. For let the machine ABC, equal in height and length to ABM, fig. 44. be furnished with four wheels, of which two are seen at D and E, the third being under C, while the fourth is concealed by the board a. Let the cylinder F be laid upon the lower end of the inclined plane CB, and the line G be extended from the frame of the cylinder about six feet, parallel to the plane CB, and fixed in that direction to a hook in the wall, which will keep the cylinder from rolling off the plane. Let one end of the line H be tied to a hook at C in the machine, and the other to a weight K, the same which drew the cylinder up the plane before. If this line be put over the fixed pulley I, the weight K will draw the machine along the horizontal plane L, and under the cylinder F; and when the machine has been drawn the whole

length CB, the cylinder will be raised to d, equal to the perpendicular height AB above the horizontal part at A.

The inclined plane, considered as a mechanical power, may easily be reduced to the lever; for the power acquired by it is always in the proportion of the length to the height, in the same manner as the power acquired by a lever is in the proportion of the long arm to the short one. To compute, or show the reason of the power of an inclined plane, therefore, we have only to construct a lever, the long arm of which is equal to the length of the plane, and the short arm to the height of it; then, whatever weight put upon the long arm counterpoises another put upon the short one, will also keep the same weight from rolling down the inclined plane.

To the inclined plane belong also the wedge, and all cutting instruments which act as wedges, as knives, hatchets, &c. From the theory of the inclined plane also combined with that of falling bodies, we deduce some of the most remarkable properties of the pendulum. See PENDULUM.

§ 5. *Of the Wedge.*

This may be considered as two equally inclined planes DEF and CEF, fig. 46. joined together at their bases e EFO: DC is the whole thickness of the wedge at its back ABCD, where the power is applied; EF is the depth or height of the wedge; DF the length of one of its sides, equal to CF the length of the other side; and OF is its sharp edge, which is entered into the wood or other matter to be split, by the force of a hammer or mallet striking perpendicularly upon its back. Thus, AB fig. 47. is a wedge driven into the cleft CED of the wood FG.

When the wood does not cleave at any distance before the wedge, there will be an equilibrium between the power impelling the wedge downward, and the resistance of the wood acting against the two sides of the wedge: if the power be to the resistance as half the thickness of the wedge at its back is to either of its sides, and if the power be increased so as to overcome the friction of the wedge, and the resistance arising from the cohesion of the wood, the wedge will be driven in, and the wood split. But when the wood splits, as it commonly does, before the wedge, the power impelling the latter will not be to the resistance of the wood as half the thickness of the wedge is to one of its sides, but as half its thickness is to the length of the other side of the cleft, estimated from the top or acting part of the wedge; for if we suppose the wedge to be lengthened down to the bottom of the cleft at E, the same proportion will hold; namely, that the power will be to the resistance, as half the thickness of the wedge is to the length of either of its sides; or, which is the same thing, as the whole thickness of the wedge is to the length of both its sides.

To prove this, let us suppose the wedge is divided lengthwise into two equal parts; in which case, it will become two equally inclined planes, one of which, as abc fig. 48. may be made use of for separating the moulding cd from the wainscot AB. It is evident, that when this half wedge has been driven its whole length ac between the wainscot and mouldings, its inside ac will

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be at *cd*, and the moulding will be separated to *fg* from the wainscot. But, from what has been already shown concerning the inclined plane, it appears, that, to have an equilibrium between the power impelling the half wedge and the resistance of the moulding, the former must be to the latter as *ab* to *ac*, that is, as the thickness of the back which receives the stroke is to the length of the side against which the moulding acts. Since, therefore, the power upon the half wedge is to the resistance against its side as the half back *ab* is to the whole side *ac*, it is plain that the power upon the whole wedge, where the whole thickness is double the half-back, must be to the resistance of both its sides as the thickness of the whole back is to the length of both sides of the cleft, when the wood splits at any distance before the wedge: For when the wedge is driven quite into the wood, and the latter splits at ever so small a distance before it, the top of the wedge then becomes the acting part, because the wood does not touch it any where else. And since the bottom of the cleft must be considered as the place where the whole resistance is accumulated, it is plain from the nature of the lever, that the farther the power is from the resistance, the greater advantage it acts with.

29
Reason of
the effects
of the
wedge.

Some have supposed, that the power of the wedge was in the proportion of the thickness of it to the length of one of its sides; but from what has already been advanced, it is plain that this cannot be the case. The wedge, as has already been shown, is composed of two inclined planes, each of which has a perpendicular height of only one half the thickness of the wedge. As the power of the inclined plane therefore is always as the length to its perpendicular height, it is evident that the power of each of these inclined planes of which the wedge is composed must be as the length of one side to half the thickness; and consequently the power of both must be as the length of both sides is to the whole thickness.

The power of the wedge is exceedingly great, inasmuch that not only wood but rocks may be split by it, which could scarce be done by any of the other powers: but in this it is assisted by percussion of the hammer which drives it, and shatters the stone in a manner that could scarcely be done by any simple pressure.—Wedges as well as pulleys have also been used as instruments of torture.

§ 6. Of the Screw.

THIS is the strongest of all the mechanical powers, though it cannot be accounted a simple one, as no screw can be made use of without a lever or winch to assist in turning it. We may suppose it made by cutting a piece of paper into the form of an inclined plane or half wedge, and then wrapping it round a cylinder, as in fig. 49. From this figure it is evident, that the winch which turns the cylinder must move once round in the time that the paper describes one spiral; and consequently if any weight or greater power of resistance were applied, the winch must turn once round in the time that the weight would move from one spiral thread to another, from *d* to *c* for instance. Hence the force of the screw will be as the circumference of the circle defined, by the lever or winch by which it is turned, is to the distance between

the threads of the screw itself. Thus, supposing the distance of the threads to be half an inch, and the length of the winch twelve inches, the circle described by the extremity of it where the power acts will be nearly 76 inches, or about 152 times the distance between the threads; whence a single pound acting at the end of such a winch would balance 152 at the extremity of the screw; and as much more as can overcome the friction would turn the winch and raise up the weight.

Fig. 50. represents a machine for exhibiting the force of the screw. Let the wheel *C* have upon its axis a screw *ab*, working in the teeth of the wheel *D*, which suppose to be 48 in number. It is plain that every time the screw *ab* and wheel *C* are turned round by the winch *A*, the wheel *D* will be moved one tooth by the screw; and therefore in 48 revolutions of the winch, the wheel *D* will be turned once round. If then the circumference of a circle described by the handle of the winch *A* be equal to the circumference of a groove *e* round the wheel *D*, the velocity of the handle will be 48 times as great as the velocity of any given point in the groove. Consequently if the line *G* goes round the groove *e*, and has a weight of 48 pounds hung to it below the pedestal *EF*, a power of one pound at the handle will balance that weight. If the line *G* goes round the axle *I* instead of the groove of the wheel *D*, the force of the machine will be as much increased as the circumference of the groove *e* is greater than that of the axle; which, supposing to be six times, then one pound at *H* will balance 288 pounds suspended by the line at the axle.

The screw is of very extensive use in mechanics, its great power rendering it more eligible for compressing bodies together than any of the rest, and the great disparity betwixt the velocity of the handle and that of the threads of the screw, rendering it proper for dividing space into an almost infinite number of parts. Hence, in the construction of many mathematical instruments, such as telescopes, where it is necessary to adjust the focus to the eyes of different people, the screw is always made use of in order to move the eyeglass a very little nearer or farther away from the object glass. In the 71st volume of the Philosophical Transactions, a new method of applying the screw, so as to make it act with the greatest accuracy, is described by Mr Hunter surgeon. The following are the general principles upon which this method depends.

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Mr Hunter's improvement on the screw.

1. That the strength of the several parts of the engine be adjusted in such a manner to the force they are intended to exert, that they shall not break under the weight they ought to counteract, nor yet encumber the motion by a greater quantity of matter than is necessary to give them a proper degree of strength.

2. That the increase of power by means of the machine be so regulated, that while the force we can exert is thereby rendered adequate to the effect, it may not be retarded in procuring it more than is absolutely necessary.

3. That the machine be as simple as is consistent with other conditions.

4. It ought to be as portable, and as little troublesome as possible in the application.

5. The moving power must be applied in such a manner as to act to the greatest advantage; and that the

Mechanical powers. the motion ultimately produced may have that direction and velocity which is most adapted to the execution of the ultimate design of the machine.

6. Of two machines, equal in other respects, that deserves the preference in which the friction least diminishes the effect proposed by the whole.

To attain all these advantages in any machine is perhaps impossible; but in the application of the screw, the following method promises to be attended with several of them.

* See the article Screw. Let AB (fig. 51.) be a plate of metal, in which the screw CD plays, having a certain number of threads in an inch, suppose 10. Within the screw CD there is a female screw*, which receives the smaller screw DE of 11 threads in an inch. This screw is kept from moving about with the former by means of the apparatus at AFG B. But if the handle CKL be turned ten times round the screw, CD will advance an inch upwards; and if we suppose the screw DE to move round along with CD, the point E will advance an inch. If we now turn the screw DE ten times backward, the point E will move downwards $\frac{1}{11}$ ths of an inch, and the result of both motions will be to lift the point E $\frac{1}{11}$ th of an inch upwards. But if, while the screw CD is turned ten times round, DE be kept from moving, the effect will be the same as if it had moved ten times round with CD, and been ten times turned back; that is, it will advance $\frac{1}{11}$ of an inch. At one turn, therefore, it will advance upwards $\frac{1}{11} \times \frac{1}{10} = \frac{1}{110}$ of an inch. If now the handle be six inches long, the power to produce an equilibrium must be to the weight as 1 to $110 \times 6.2832 \times 6 = 4146.912$. Thus the force of Mr Hunter's screw is greatly superior to that of the common one; for in order to have as great a power on the plan of the latter, it must have 110 threads in an inch, which would render it too weak to resist any considerable violence.

With regard to the second general maxim above laid down, Mr Hunter considers both kinds of screws as equally applicable, only that the more complicated structure, and consequently greater expence of his screw, renders it convenient to use the common screw where only a small increase of power is necessary, and his improved one where a great power is wanted. By shortening the handle also, the whole machine is rendered more portable and less troublesome in the using.

To answer the fifth intention, both seem to be equally proper; but for the sixth, the preference must be given to such as best answer the particular purpose proposed. Thus if the screw DE be designed to carry an index which must turn round at the same time that it rises upward, the common screw is preferable; though our author also proposes a method by which his screw may answer the same purpose: With this view a still smaller screw ought to play within the screw DE, and be connected with the screw CD, so as to move round along with it. It must have, according to the foregoing proportions, 111 threads in an inch; and they must lie in a contrary direction to those of CD; so that when they are both turned together, and CD moves upwards, this other may move downwards. At one turn this will move upwards $\frac{1}{111} \times \frac{1}{10}$ th part of an inch, and at the same time will move in a circular direction; but the accuracy

Mechanical powers. required in constructing such screws, even though made with fewer threads than those just mentioned, would probably be too great for practice. In many cases, however, screws upon Mr Hunter's principles may be of considerable use.

³² Theory of the screw. The theory of the screw is easily deduced from that of the inclined plane and lever; for the threads of the screw in fact form a continued inclined plane, the height of which is the distance betwixt the two threads, and the length is the circumference of the cylinder. Hence, without any lever, the screw would have a considerable power, were it not for the great friction of the parts upon one another; and this friction would be much more increased by the perpendicular action of a weight on the top of the cylinder than by the horizontal action of a lever.

§ 7. Other methods of accumulating power, which do not properly come under the denomination of any of the mechanical powers already described.

FROM the account already given of the six mechanical powers, it is evident, that they can do no more than accumulate, or, if we may use the expression, *compress*, any degree of velocity into a small space. The velocity thus compressed, becomes what we call *power*, and is capable of again impressing the original degree of velocity upon a body of an equal or nearly equal size to the first which originally impressed it; but in every case the absolute quantity of motion, or of power, remains the same without a possibility of augmentation or diminution by levers, screws, pulleys, or wedges. It follows, therefore, that if by any method we can preserve for a certain time a small quantity of motion, that will at the end of the time specified amount to an astonishing power, which we could scarce at first have imagined to proceed from so small a cause. Thus, though a man cannot raise a ton weight from the ground at once, he is easily capable of raising 100 pounds at once from the ground, and this for a considerable number of times in succession. It is plain, therefore, that in a very short time a man could in this manner raise the ton weight, if it were divided into 20 parts, as effectually as by a lever or other machine; though the fatigue consequent upon stooping down and raising up his body so often would no doubt make the toil much greater. Even by means of a lever, however, before a man could raise a ton weight one foot from the ground, with the trouble of exerting a force equal to 100 pounds, he must have a lever 20 or 21 feet in length, and exert a constant force of 100 pounds, while he goes up through a space of 20 feet, or pulls down a rope through that space. The lever, therefore, only accumulates the power exerted in pulling or carrying the weight of 100 pounds through 20 feet, and discharges it all upon the space of one foot; whence it is plain, that any other thing which could do this would raise the ton weight as effectually as the lever.

One method of accumulating a great power is by suspending a very heavy body by a chain or strong rope of considerable length. This body may be put in motion by a very small degree of power more than is requisite for bending the rope, and will acquire a vibratory motion like a pendulum; by continuing the impulse as the body returns, it will continually acquire greater and greater force, the arches through which

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powers.

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powers.

it moves becoming continually larger, until at last it might be made to overcome almost any obstacle: and upon this principle the battering rams of old were constructed, the power of which has been already mentioned; nevertheless the power of one stroke of this engine never could exceed the accumulated power of the impulses given to it in order to produce that stroke, or even quite equal it, because the stiffness of the rope, and the resistance of the air, must always take off something from it.

Another method of accumulating force is by means of a very heavy wheel or cylinder, moveable about an axis. A small force will be sufficient to put this wheel in motion; and, if long continued, will accumulate in such a manner as to produce such effects in raising weights and overcoming resistances, as could not by any means be accomplished by the application of the original moving force. On this subject Mr Atwood has demonstrated, that a force of 20 pounds applied for 37 seconds to the circumference of a cylinder of 10 feet radius, and weighing 4713 pounds, would, at the distance of one foot from the centre, give an impulse to a musket-ball equivalent to what it receives from a full charge of gun-powder. The same effect would be produced in six minutes and ten seconds by a man turning the cylinder with a winch one foot long, in which he constantly exerted a force of 20 pounds. In this case, however, as well as the former, there is not any absolute accumulation of power; for the cylinder has no principle of motion in itself, and cannot have more than it receives.

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Of the use
of flies in
various ma-
chines.

This accumulation of motion, however, in heavy wheels, is of great service in the construction of machines for various purposes, rendering them greatly more powerful and easy to be worked by animals, as well as more regular and steady, when set in motion by water, or any inanimate power. Hence the use of flies, ballast-wheels, &c. which are commonly supposed to increase the power of a machine, though in reality they take something from it, and act upon a quite different principle.—In all machines in which flies are used, a considerably greater force must at first be applied than what is necessary to move the machine without it, or the fly must have been set in motion some time before it is applied to the machine. It is this superfluous power which is collected by the fly, and serves as a kind of reservoir from which the machine may be supplied when the animal slackens his efforts. This, we must observe, will always be the case with animals, for none are able to exert a great power with absolute constancy; some intervals of rest, even though almost imperceptible, are requisite, otherwise the creature's strength would in a short time be entirely exhausted. When he begins to move the machine he is vigorous, and exerts a great power; in consequence of which he overcomes not only the resistance of the machine itself, but communicates a considerable degree of power to the fly. The machine, when moving, yields for a time to a smaller impulse; during which time the fly itself acts as a moving power, and the animal recovers the strength he had lost. By degrees, however, the motion of the machine decreases, and the animal is obliged to renew his efforts. The velocity of the machine would now be considerably increased, were it not that the fly now

Nº 199.

acts as a resisting power, and the greatest part of the superfluous motion is lodged in it, so that the increase of velocity in the machine is scarcely perceptible. Thus the animal has time to rest himself until the machine again requires an increased impulse, and so on alternately.—The case is the same with a machine moved by water, or by a weight; for tho' the strength of these does not exhaust itself like that of an animal, yet the yielding of the parts of the machine renders the impulse much less after it begins to move: hence its velocity is accelerated for some time, until the impulse becomes so small that the machine requires an increase of power to keep up the necessary motion. Hence the machine slackens its pace, the water meets with more resistance, and of consequence exerts its power more fully, and the machine recovers its velocity. But when a fly is added to the other parts, this acts first as a power of resistance, so that the machine cannot acquire the velocity it would otherwise do. When it next begins to yield to the pressure of the water, and the impulse of course to slacken, the fly communicates part of its motion to the other parts; so that if the machine be well made, there is very little difference in the velocity perceptible.—The truth of what is here advanced will easily be seen, from considering the inequality of motion in a clock when the pendulum is off, and how very regularly it goes when regulated by the pendulum, which here act as a fly.

Flies are particularly useful in any kind of work which is done by alternate strokes, as the lifting of large pestles, pumping of water, &c. In this case the weight of the wheel employed is a principal object; and the method of calculating this is to compare it with the weight to be raised at each stroke of the machine. Thus, suppose it required to raise a pestle 30 pounds weight to the height of one foot 60 times in a minute: Let the diameter of the fly be seven feet, and suppose the pestle to be lifted once at every revolution of the fly; we must then consider what weight passing through 22 feet in a second will be equivalent to 30 pounds moving through one foot in a second. This will be $30 \div 22$ or $1\frac{4}{11}$ pounds. Were a fly of this kind to be applied, therefore, and the machine set a going, the fly would just be able to lift the pestle once after the moving power was withdrawn; but by increasing the weight of the fly to 10, 12, or 20 pounds, the machine when left to itself would make a considerable number of strokes, and be worked with much less labour than if no fly had been used, though no doubt at the first it would be found a considerable incumbrance to the motion. This is equally applicable to the action of pumps; but the weight which can be most advantageously given to a fly has never yet been determined by mechanics. It is certain, however, that the fly does not communicate any absolute increase of power to the machine; for if a man or other animal is not able to set any mechanical engine in motion without a fly, he will not be able to do it though a fly be applied, nor will he be able to keep it in motion though set a-going with a fly by means of a greater power. This may seem to be contradicted by the example of a common clock; for if the pendulum be once stopped, the weight is not able to set it in motion again, though it will keep it going when once put in motion by an external power. This, however,

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Of the
weight of
flies.

Fig. 46.



Fig. 47.



Fig. 48.



Fig. 49.

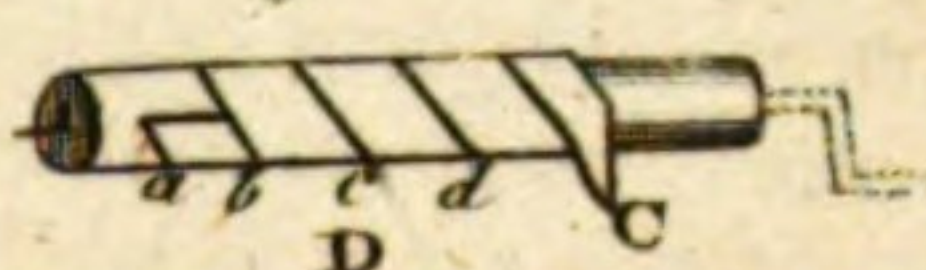


Fig. 50.

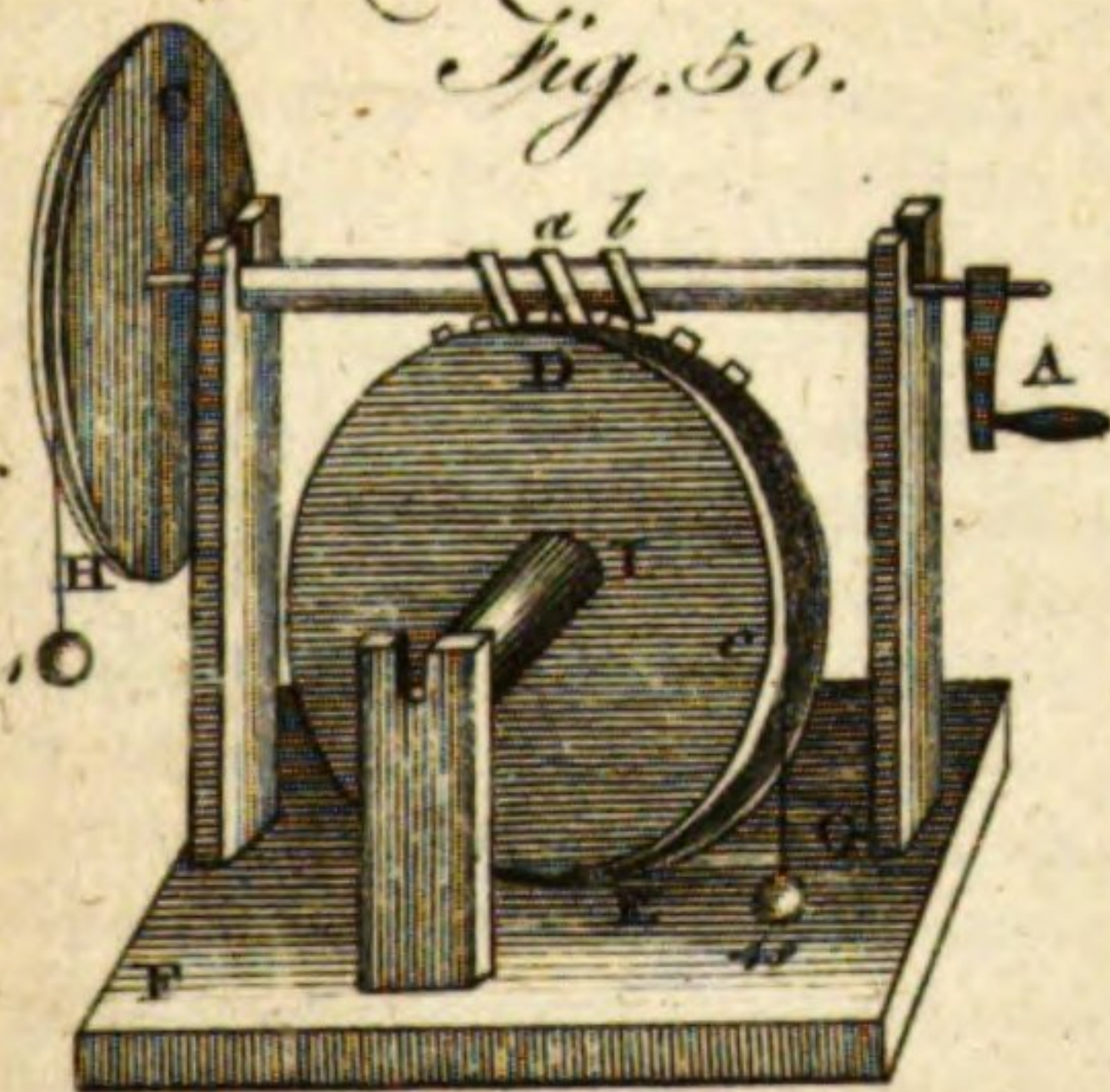


Fig. 54.

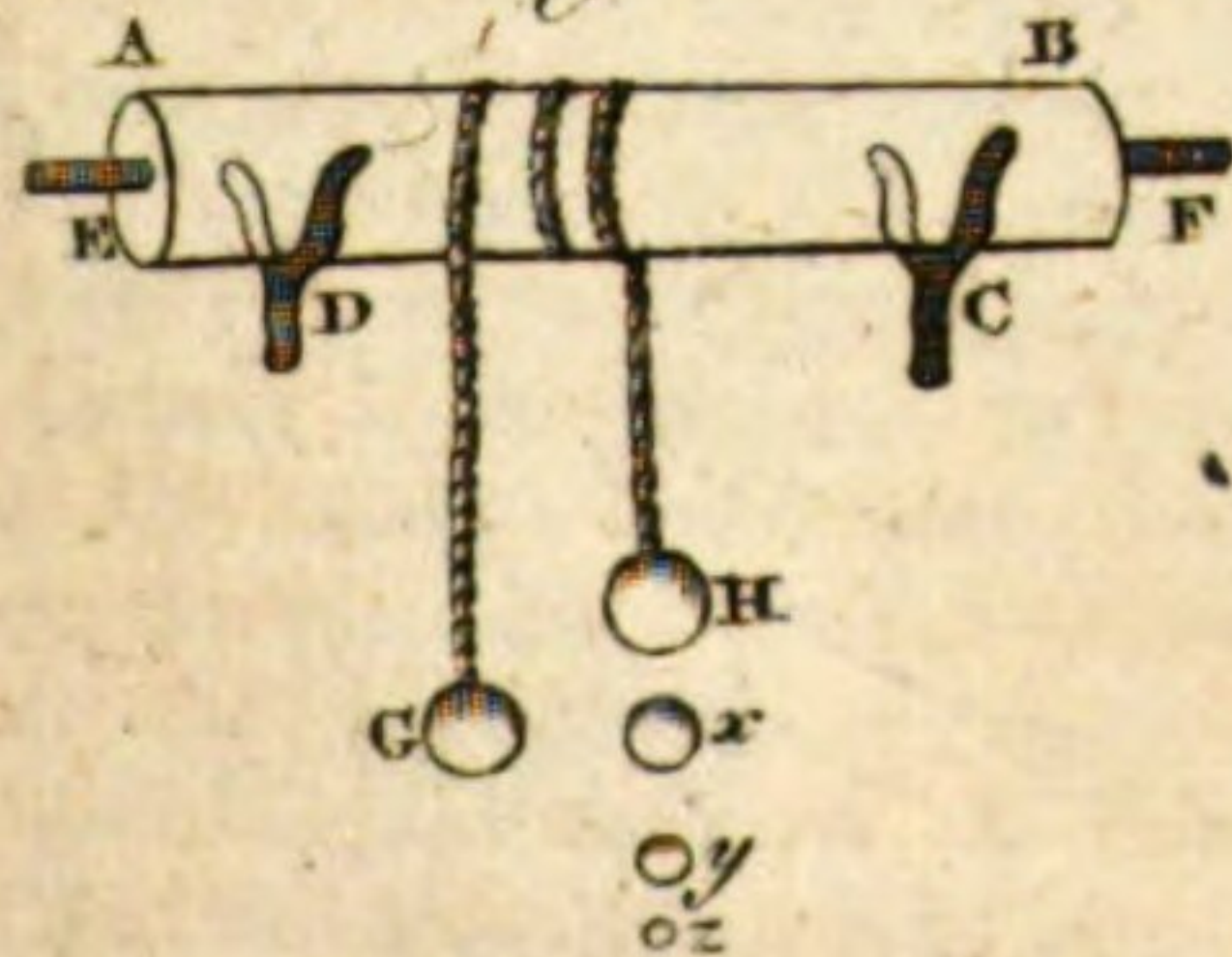


Fig. 51.

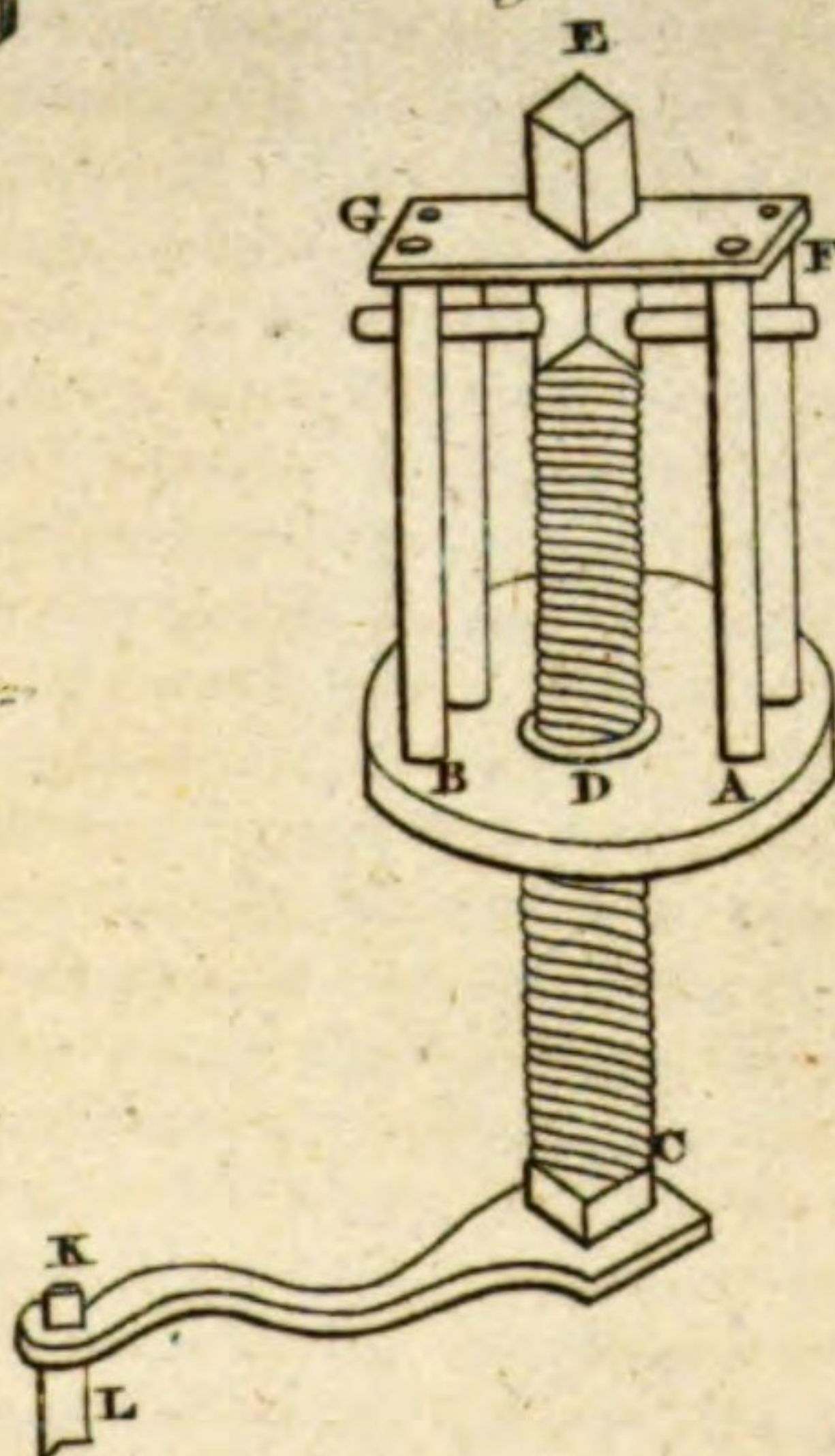


Fig. 55.

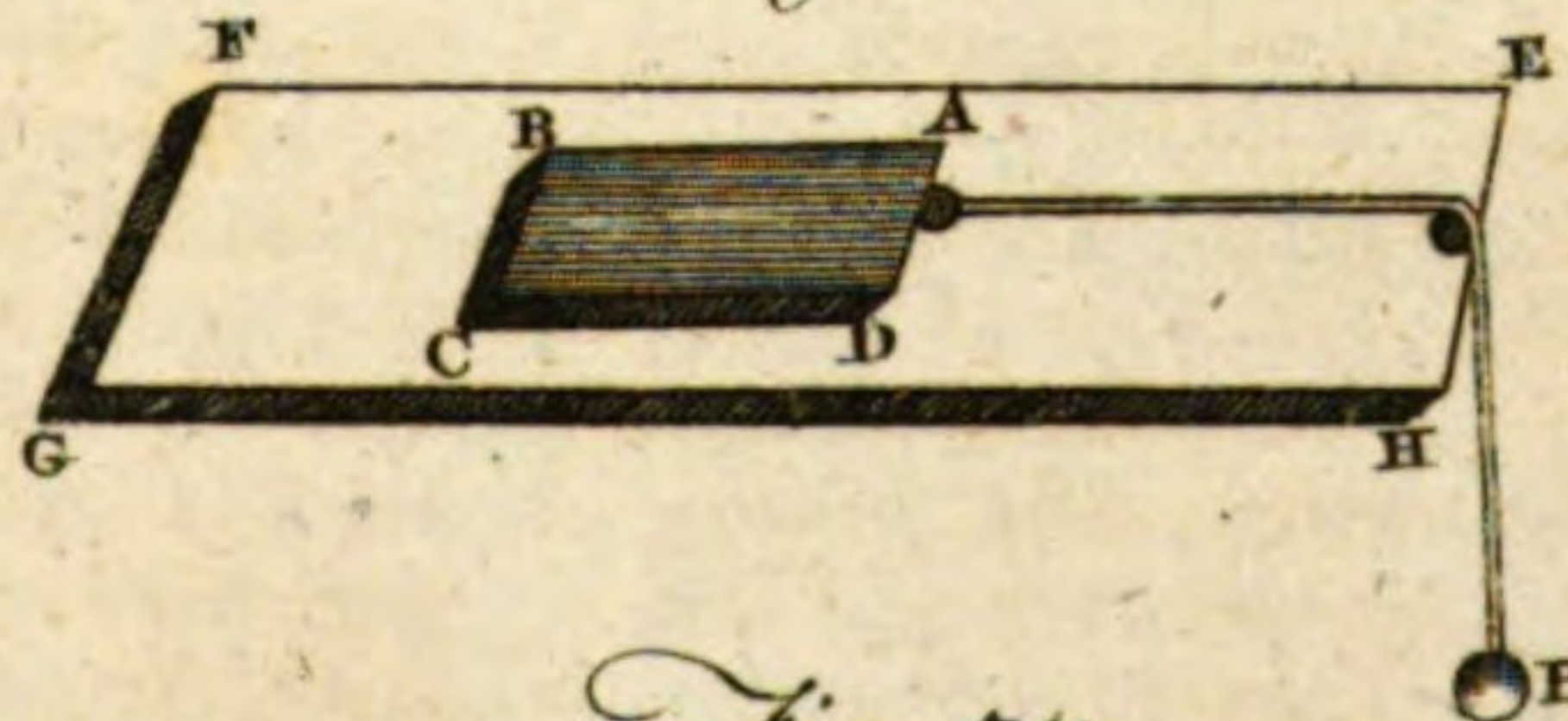


Fig. 57.



Fig. 52.

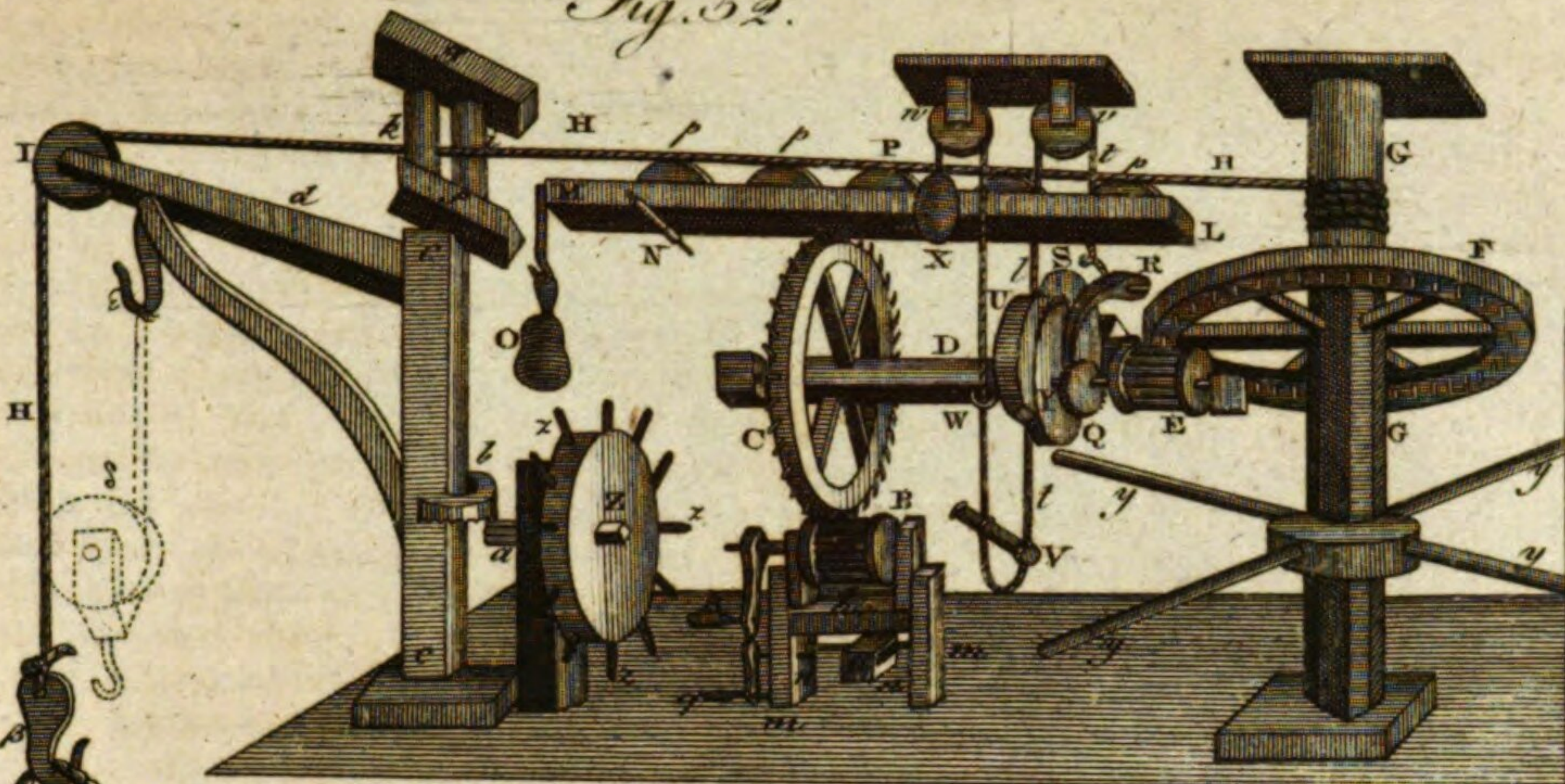


Fig. 53.

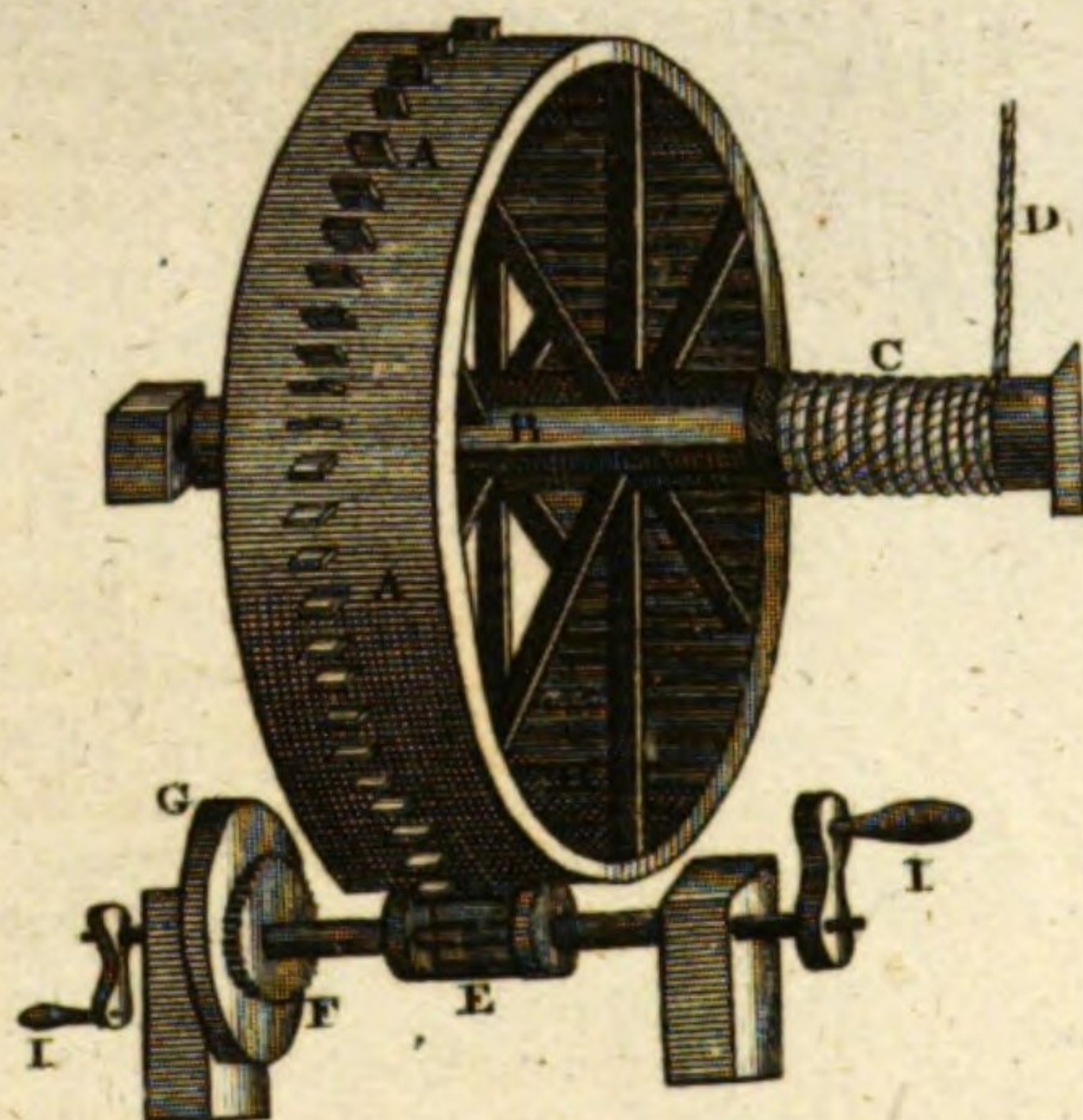


Fig. 56.

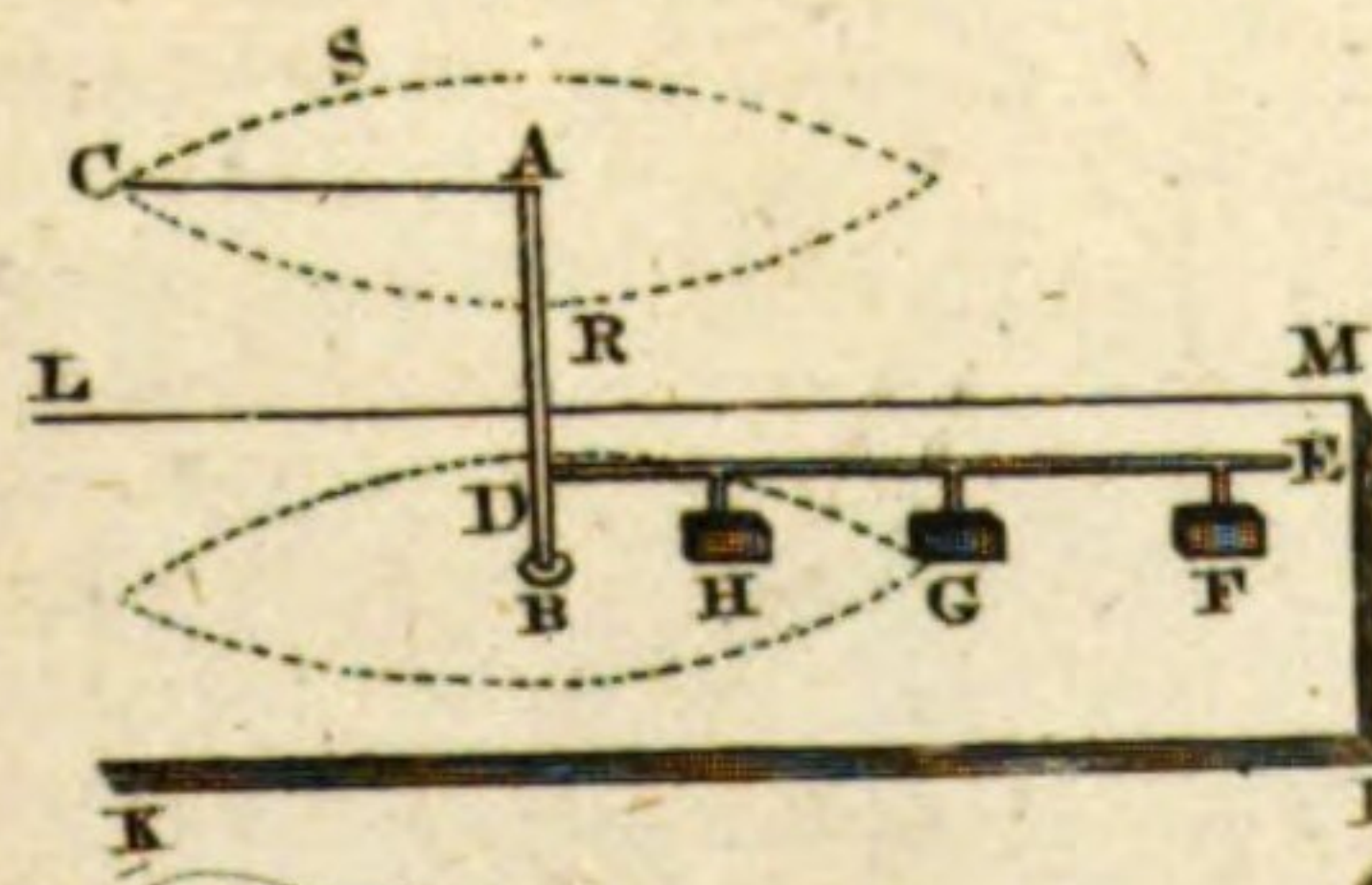
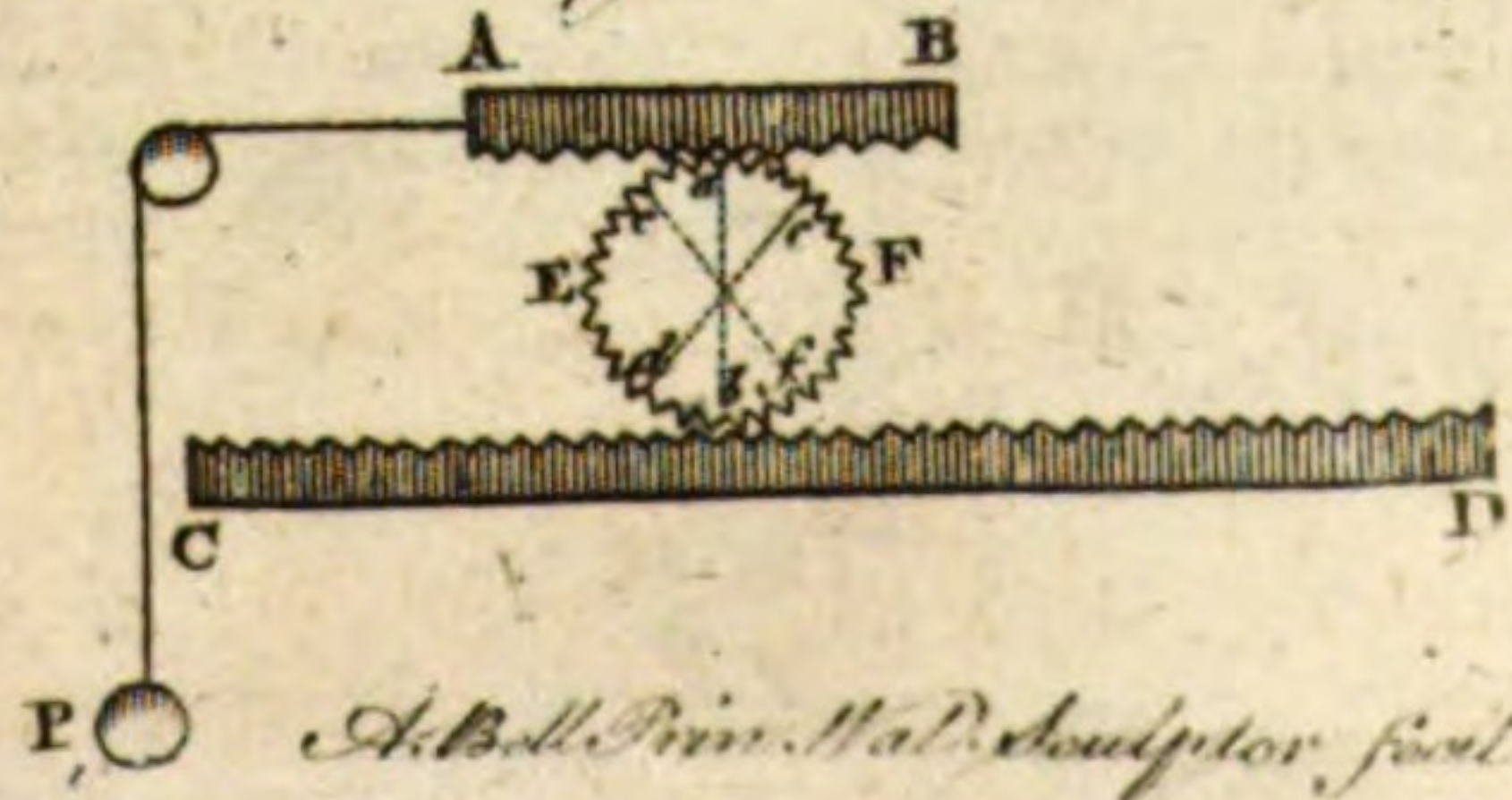


Fig. 58.



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depends not upon any insufficiency of the weight, but on the particular mechanism of the crown wheel; which is such, that when once the pendulum is stopped, it would require a much greater weight than that commonly applied to set it in motion; and if the usual weight was to act fairly, it would be more than sufficient to move all the machinery, and make the pendulum vibrate also with much greater force than it does.

§ 8. Of Friction.

THE doctrine of friction, according to Mr Ferguson, may be summed up in the following manner:

1. When one body insists on another upon a horizontal plane, it presses it with its whole weight; which being equally reacted on, and consequently the whole effect of its gravity destroyed by the plane, it will be absolutely free to move in any horizontal direction by any the least power applied thereto, provided both the touching surfaces be perfectly smooth. 2. But since we find no such thing as perfect smoothness in the surfaces of bodies, but an evident roughness or unevenness of the parts in their surface, arising from their porosity and peculiar texture, it is easy to understand, that, when two such surfaces come together, the prominent parts of one will in some measure fall into the concave parts of the other; and therefore, when an horizontal motion is attempted in one, the fixed prominent parts of the other will give more or less resistance to the moving surface, by holding and detaining its parts; and this is what we call *friction*. 3. Now since any body will require a force proportional to its weight to draw it over a given obstacle, it follows, that the friction arising to the moving body will always be in proportion to its weight only, and not the quantity of the surface by which it bears upon the resisting plane or surface. Thus, if a piece of wood four inches wide and one thick be laid upon another fixed piece of the same wood, it will require the same weight to draw it along, whether it be laid on its broad or narrow side. 4. For though there be four times the number of touching particles on the broad side (*ceteris paribus*), yet each particle is pressed with but $\frac{1}{4}$ th of the weight that those are on the narrow side; and since four times the number, multiplied by $\frac{1}{4}$ th of the weight, is equal to $\frac{1}{4}$ th of the number multiplied by four times the weight, it is plain the resistance is equal in both cases, and so requires the same force to overcome it. 5. The reason why friction is proportional to the weight of the moving body is, because the power applied to move the body must raise it over the prominent parts of the surface on which it is drawn; and this motion of the body, as it is not upright, so it will not require a power equal to its whole weight; but being in the nature of the motion on an inclined plane, it will require only a part of its own weight, which will vary with the various degrees of smoothness and asperity. 6. It is found by experiment, that a body will be drawn along by nearly $\frac{1}{3}$ d of its weight; and if the surfaces be hard and well polished, by less than a third part; whereas if the parts be soft or ragged, it will require a much greater weight. Thus also the cylinder of wood AB, if very smooth, and laid on two well polished supporters CD (having been first oiled or greased), and

then charged with the weight of two pounds in the two equal balls GH, it will require an additional weight x , equal to about a third part of the two pounds, to give motion to or overcome the friction of the said cylinder. 7. Now this additional weight, as it causes a greater weight of the cylinder, will likewise increase the friction; and therefore require the addition of another weight y , equal to the third part of its own weight; for the same reason, the weight y will require another z , a third part less; and so on *ad infinitum*. Hence, supposing the friction to be precisely a third of the weight, the first weight with all the additional ones, *viz.* $2, \frac{2}{3}, \frac{2}{9}, \frac{2}{27}, \&c.$ will be a series of numbers in geometrical progression decreasing. Now the sum of all these terms, except the first, is found, by a well-known theorem in arithmetic, to be equal to one pound. So that if the weight of the cylinder be inconsiderable, the readiest way to overcome the friction would be to double the power G, or H, at once. 8. But though we may, at a medium, allow a third part of the weight with which any simple machine is charged for the friction arising from thence, yet this is very precarious, and seldom is the case: for if ABCD be a piece of brass of six ounces, and EFGH be also a plate of brass, and both the surfaces well ground and polished, the weight P of near two ounces will be required to draw along the body AC alone; but if AC be loaded with 6, 8, or 10 lb. then a sixth part of the weight will be sufficient to draw it along the plane. On the other hand, if the plane be covered with a linen or woollen cloth, then a third or half part, and sometimes more, will be requisite to draw it along on the plane. 9. Yet notwithstanding the difficulty and uncertainty attending the estimation of the quantity of friction, it is still a most useful and necessary inquiry, how and by what means the friction of any machine may be diminished? In order to this, we must consider friction mechanically, or as a force acting against a power applied to overcome it. Thus suppose AB an upright stem or shaft, turning freely in the socket B fixed in the table or plane IKLM; and AC, DE, two arms fixed in the said shaft, the latter of which, DE, has three pins going into a socket in the middle of heavy weights, F, G, or H, in such a manner, that when a power applied at C moves the lever AC, it causes the lever DE to protrude or thrust along the weights at F, G, or H, in a circular manner upon the table. 10. Now since we suppose the weight, all the while it is in motion, is freely and wholly supported by the plane, it follows, that all the resistance it can give to the power applied to C, is only what arises from its friction on the plane. What this friction is, will be found by applying the weight at G, so that BG be equal to AC; for then the power applied to C, acting in a tangent to the circle CRS, that shall just move the weight G, will be equal to its friction. But if the weight be applied at F, because BF is greater than AC, the same power at C, as before, will not move it, by reason its force is here increased, by having a greater velocity than the power; as, on the other hand, if placed at H, a less power at C shall move it, because of its having there less velocity than the power, as is evident from the properties of the lever. 11. Hence we understand, that though the

Fig. 55.

Fig. 56.

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weight of a machine remains the same; yet the friction may be diminished, by contriving that the parts on which it moves and rubs shall have less velocity than the power which moves it: thus, if the cylinder AB (fig. 54.) were to move on the two small pins or gudgeons E, F, the friction would be abated in the proportion of the diameter of the cylinder to that of the pins. 12. The friction on these gudgeons is still farther diminished by causing them to move on the circumference of a wheel: thus, let F be the gudgeon of the cylinder, revolving on the wheel CDE (fig. 57.), the velocity of the wheel's circumference will be the same with that of the gudgeon; but the velocity of the wheel's axis AB (which is now to be considered as the rubbing part) is less than that of the wheel, in proportion as its diameter is less than that of the wheel: for example, if the friction of the cylinder moving on its surface be $\frac{1}{10}$ th part of the weight, and the gudgeon be to the cylinder as 1:10, they will reduce the friction to $\frac{1}{100}$ th part; and if, again, the axis of the wheel be to the wheel as 1:10, the wheel will reduce the friction to $\frac{1}{1000}$ th part; and if the axis of this wheel be laid on the perimeter of another wheel, the friction will be reduced to a still lesser part of the weight; so that you may proceed in this manner to diminish the friction *ad infinitum*; and wheels applied in this manner are called *friction-wheels*. 13. Besides what has been already said, somewhat farther is necessary to diminish the friction of wheel-carriages. It was before observed, that friction arose chiefly by lifting the body over the prominent parts of the plane on which it is moved: now if we can contrive to move the body along without lifting or sustaining its weight, we shall move it without much friction; and this may be done by laying the body on any moveable circular subject, as rollers, wheels, &c.: because the asperities of its surface will lay hold on those of the roller, and move it likewise; and it is as evident, that when the body is drawn against the prominent parts of the roller, they immediately give way, and make no resistance. By this circular motion of the roller, its prominent parts below do only descend and move upon or over, and are not drawn against, the fixed prominent parts of the plane, and so receive no resistance from them. Hence the body is conveyed along without being lifted up, in the same manner as a wheel is moved by a pinion without any considerable resistance.

SECT. III. Of the Combinations of the Mechanical Powers.

FROM what has been already laid down concerning the mechanical powers in particular, we have seen that none of them is capable of augmenting the absolute force of any acting substance; and from thence we may justly conclude, that no combination of them can do so. In fact, these combinations are very often detrimental, and occasion a great loss of power by friction. This is the great obstacle in mechanics, and must always be greater in complex than in simple machines; and therefore the latter are always to be preferred, excepting where conveniency requires some degree of complication. The lever being the simplest machine, and that attended with least friction, is always to be

used where it is requisite to raise weights for a small way. It may likewise be used with propriety where bodies are to undergo a long continued degree of pressure, and where they yield but little. For this purpose the lever ought to be of the second kind, represented fig. 28. where one end being fixed at A, a weight may be put upon the other extremity B, and the body to be pressed put at 1, 2, or any of the intermediate divisions, according to the degree of pressure it is designed to undergo. This has the advantage of giving a long and very equable pressure, and is a very advantageous method of pressing cheese or other things which do not require a very great exertion of force. Where this is requisite we must employ wedges or screws; but both these have the disadvantage of slackening their pressure on the least yielding of the materials to be pressed. Wedges therefore require to be almost constantly driven, and screws to be turned by a lever, in order to produce a constant pressure. In oil mills the pressure is produced by wedges, which are constantly driven by great mallets lifted up by the force of the mill. Oil of sweet almonds is made by apothecaries in a press driven by a screw, and turned by a long lever assisted by a capstan.

Where it is necessary to have a considerable weight raised to some height, the pulley is the most useful power, but the friction is extremely great; the axis in peritrochio combined with a single pulley will answer the purpose extremely well, and with less friction than any machine composed of pulleys alone. The machines called *cranes* are generally combinations of these two; and are very much used, especially by the commercial people, for raising goods out of ships, drawing them up into warehouses, and for lowering them down. In these operations we must observe, that lowering goods is much more dangerous than raising them, on account of the vast increase of velocity which bodies acquire every moment by the power of gravity. In the construction of cranes, therefore, it is absolutely necessary to attend to this circumstance, and to guard against accidents. The following are recommended by Mr Ferguson: Fig. 52. shows one crane well calculated for the purposes just mentioned. When the rope H is hooked to the weight K, a man turns the winch A, on the axis whereof is the trundle B, which turns the wheel C, on whose axis D is the trundle E, which turns the wheel F with its upright axis G, on which the great rope HH winds as the wheel turns; and going over a pulley I, at the end of the arm *d* of the gib *cde*, it draws up the heavy burden K; which being raised to a proper height, as from a ship to the quay, is then brought over the quay by pulling the wheel Z round by the handles *z, z*, which turns the gib by means of the half wheel *b* fixed on the gib-post *cc*, and the strong pinion *a* fixed on the axis of the wheel Z. This wheel gives the man that turns it an absolute command over the gib, so as to prevent it from taking any unlucky swing, such as often happens when it is only guided by a rope tied to its arm *d*; and people are frequently hurt, sometimes killed, by such accidents.

The great rope goes between two upright rollers *i* and *k*, which turn upon gudgeons in the fixed beams *f* and *g*; and as the gib is turned towards either side, the rope bends upon the roller next that side. Were it

Combination of Mechanical Powers.

Plate CCLXXXIII.

35
The Best method of constructing cranes.

Plate CCLXXXV.

Combina-
tion of Me-
chanical
Powers.

it not for these rollers, the gib would be quite unmanageable; for the moment it were turned ever so little towards any side, the weight K would begin to descend, because the rope would be shortened between the pulley I and axis G; and so the gib would be pulled violently to that side, and either be broken to pieces or break every thing that came in its way. These rollers must be placed so that the sides of them round which the rope bends may keep the middle of the bended part directly even with the centre of the hole in which the upper gudgeon of the gib turns in the beam *f*. The truer these rollers are placed, the easier the gib is managed, and the less apt to swing either way by the force of the weight K.

A ratchet-wheel Q is fixed upon the axis D, near the trundle E; and into this wheel falls the catch or click R. This hinders the machine from running back by the weight of the burden K, if the man who raises it should happen to be careless, and to leave off working at the winch A sooner than he ought to do.

When the burden K is raised to its proper height from the ship, and brought over the quay by turning the gib about, it is let down gently upon the quay, or into a cart standing thereon, in the following manner: A man takes hold of the rope *tt* (which goes over the pulley *v*, and is tied to a hook at S in the catch R), and so disengages the catch from the ratchet-wheel Q; and then, the man at the winch A turns it backward, and lets down the weight K. But if the weight pulls too hard against this man, another lays hold of the handle V, and by pulling it downward draws the gripe U close to the wheel Y, which by rubbing hard against the gripe hinders the too quick descent of the weight; and not only so, but even stops it at any time if required. By this means, heavy goods may be either raised or let down at pleasure, without any danger of hurting the men who work the engine.

When part of the goods are craned up, and the rope is to be let down for more, the catch R is first disengaged from the ratchet-wheel Q, by pulling the cord *t*; then the handle *q* is turned half round backward, which, by the crank *nn* in the piece *o*, pulls down the frame *b* between the guides *m* and *m* (in which it slides in a groove), and so disengages the trundle B from the wheel C: and then the heavy hook *β* at the end of the rope H descends by its own weight, and turns back the great wheel F with its trundle E and the wheel C; and this last wheel acts like a fly against the wheel F and hook *β*, and so hinders it from going down too quick; whilst the weight X keeps up the gripe U from rubbing against the wheel Y, by means of a cord going from the weight over the pulley *w* to the hook W in the gripe; so that the gripe never touches the wheel unless it be pulled down by the handle V.

When the crane is to be set at work again for drawing up another burden, the handle *q* is turned half round forwards; which, by the crank *nn*, raises up the frame *b*, and causes the trundle B to lay hold of the wheel C; and then, by turning the winch A, the burden of goods K is drawn up as before.

The crank *nn* turns pretty stiff in the mortise near *o*, and stops against the farther end of it when it has got just a little beyond the perpendicular; so that it can never come back of itself: and therefore the

trundle B can never come away from the wheel C until the handle *q* be turned half round.

The great rope runs upon rollers *pp* in the lever LM, which keep it from bending between the axle at G and the pulley I. This lever turns upon the axis N by means of the weight O, which is just sufficient to keep its end L up to the rope; so that, as the great axle turns, and the rope coils round it, the lever rises with the rope, and prevents the coilings from going over one another.

The power of this crane may be estimated thus: Suppose the trundle B to have 13 staves or rounds, and the wheel C to have 78 spur-cogs; the trundle E to have 14 staves, and the wheel F 56 cogs: then, by multiplying the staves of the trundles, 13 and 14, into one another, their product will be 182; and by multiplying the cogs of the wheels, 78 and 56, into one another, their product will be 4368; and dividing 4368 by 182, the quotient will be 24: which shows that the winch A makes 24 turns for one turn of the wheel F and its axle G, on which the great rope or chain HHH winds. So that if the length or radius of the winch A were only equal to half the diameter of the great axle G, added to half the thickness of the rope H, the power of the crane would be as 24 to 1: but the radius of the winch being double the above length, it doubles the said power, and so makes it as 48 to 1: in which case, a man may raise 48 times as much weight by this engine as he could do by his natural strength without it, making proper allowance for the friction of the working parts. Two men may work at once, by having another winch on the opposite end of the axis of the trundle under B, and so make the power still double.

If this power be thought greater than what may be generally wanted, the wheels may be made with fewer cogs in proportion to the staves in the trundles; and so the power may be of whatever degree is judged to be requisite. But if the weight be so great as will require yet more power to raise it (suppose a double quantity), then the rope H may be put under a moveable pulley, as *δ*, and the end of it tied to a hook in the gib at *ε*; which will give a double power to the machine, and so raise a double weight hooked to the block of the moveable pulley.

When only small burdens are so raised, this may be quickly done by men pushing the axle G round by the handspokes *y, y, y, y*; having first disengaged the trundle B from the wheel C: and then, this wheel will only act as a fly upon the wheel F; and the catch R will prevent its running back, if the men should inadvertently leave off pushing before the burden be unhooked from *β*.

Lastly, when very heavy burdens are to be raised, which might endanger the breaking of the cogs in the wheel F; their force against these cogs may be much abated by men pushing round the handspokes *y, y, y, y*, whilst the man at A turns the winch.

We have only shown the working parts of this crane, without the whole of the beams which support them; knowing that these are easily supposed, and that if they had been drawn, they would have hid a great deal of the working parts from sight, and also confused the figure.

Another very good crane is made in the following manner:

Combina-
tion of Me-
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Powers.

Combina-
tion of Me-
chanical
Powers.

36
Another
crane.

manner: AA (fig. 53) is a great wheel turned by men walking within it at H. On the part C, of its axle BC, the great rope D is wound as the wheel turns; and this rope draws up goods in the same way as the rope HH does in the above-mentioned crane, the gib-work here being supposed to be of the same sort. But these cranes are very dangerous to the men in the wheel; for if any of the men should chance to fall, the burden will make the wheel run back and throw them all about within it; which often breaks their limbs, and sometimes kills them. The late ingenious Mr Padmore of Bristol (whose contrivance the fore-mentioned crane is), observing this dangerous construction, contrived a method for remedying it, by putting cogs all around the outside of the wheel, and applying a trundle E to turn it; which increases the power as much as the number of cogs in the wheel is greater than the number of staves in the trundle: and by putting a ratchet-wheel F on the axis of the trundle (as in the above-mentioned crane), with a catch to fall into it, the great wheel is stopt from running back by the force of the weight, even if all the men in it should leave off walking. And by one man working at the winch I, or two men at the opposite winches when needful, the men in the wheel are much assisted, and much greater weights are raised, than could be by men only within the wheel. Mr Padmore put also a gripe-wheel G upon the axis of the trundle, which being pinched in the same manner as described in the former crane, heavy burdens may be let down without the least danger. And before this contrivance, the lowering of goods was always attended with the utmost danger to the men in the wheel; as every one must be sensible of who has seen such engines at work. And it is surprising that the masters of wharfs and cranes should be so regardless of the limbs, or even lives of their workmen, that, excepting the late Sir James Creed of Greenwich, and some gentlemen at Bristol, there is scarce an instance of any who has used this safe contrivance.

37
Mr Gott-
lieb's new
crane.

Plate
CCLXXXVI.

We shall describe here four new cranes invented and made by Mr Gottlieb of Hounsditch, London, who communicates them to the public as quite new in their principles, and more simple and useful than any hitherto contrived. Fig. 59. is a representation of a crane adapted for a large warehouse, where heavy goods are wanted to be drawn up from a cart or quay. One of this construction has lately been erected in Mr Camden's sugar-house, Old Gravel-Lane, London. Its operation is as follows: The horse yoked below at A turns the upright axis and the wheel B, which is about 6 feet in diameter; this turns a 3 feet wheel C, having an upright axis D through the floor turning with it, and carrying a 3 feet wheel E with perpendicular cogs. The wheel E turns two pinions F and G, the former of 8 inches in diameter, and the latter of 5 inches diameter, both fixed upon one axis. The pinion G turns a 3 feet wheel H, to which is fixed the barrel I and wheel W. The rope K winds round the barrel, and comes over the sheiff-wheel L in the upper story, and the pulley M in the gib-head drawing up the goods suspended at the hook N.

By a mark made upon the rope at I, the man superintending the crane knows when the goods are raised enough for landing into the room: he then imme-

diately pushes aside the upright piece O, disengages the lever P from it; and by putting it downwards, the action of the quarter pinion at Q raises up the pinion at G, and thereby unconnects it with the wheel H. To prevent the machinery now from running backwards, a ratchet-wheel R is fixed upon the wheel H, into which a click-catch S falls. This effectually prevents the wheels going backwards by the weight at N while the man above is employed in landing the goods. When the goods are brought into the store-room, the hook N is thrown out, and the man below, from the usual call, runs to the handle U, slides the pinion T into the wheel H, then turns back the ratchet-wheel R, and pushes back the click S, then slides back again the pinion T; and the wheel H and barrel I being thus at liberty, the hook N and rope run down by their own gravity, and fresh goods are attached; then again, from the usual call, the man pushes up the lever P, fixes it at O, places the click S into the teeth of the ratchet-wheel; and the whole machinery is again in action from the horse below, that keeps constantly going without being stopped at every short interval of the landing, storing, &c.

When the goods are to be carted off, and required to be let down only, it is performed without the horse, and in the following manner: The pinion G is disengaged from the wheel H by the lever P as before, and the pinion V of the fly-wheel is slipped into the teeth of the 2 feet wheel W. The goods being suspended at N, will act by the rope upon the wheel W and pinion V, thereby turning round the fly-wheel X; while the goods are thus descending, the man presses upon the lever Y, and bears against the wheel, making such a resistance as to be sufficient to allow the goods to descend with as gentle a degree of motion as may be necessary.

The hook N being taken from the goods, the man goes to the wheel W, and with his hands turns it round, which winds up the cord and hook in readiness for more goods, and so on as before. The pinions T and V in this case are slipped out of the wheels H and W.

As the horse at A may likewise be used to turn other mill-work from a connection made with the main-wheel, and supposing that the crane is not wanted at the same time, it is readily disengaged by turning of the winch at Z; which, by the pinion a below, working into the teeth of the bar, and the wheel C which turns upon it, quite unconnects the wheel C from the crane.

It is therefore evident from what has been described, that this crane can be managed by two men only, and occasionally without a horse, when very heavy goods are not raised. All the necessary beams for fixing the machinery by, could not be represented in the figure without obscurity and confusion; but these being omitted, will not to the most ordinary mechanic render the general construction of the crane difficult to understand.

A new portable cellar crane is represented in fig. 60. which is very useful to wine-merchants, brewers, &c. in drawing up and letting down casks full of wine, beer, &c. It saves the trouble and inconvenience of horses, and in many places can be used where horses could not. AA are two wooden props about 6 feet in height, and

Combina-
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Powers.

Fig. 59.

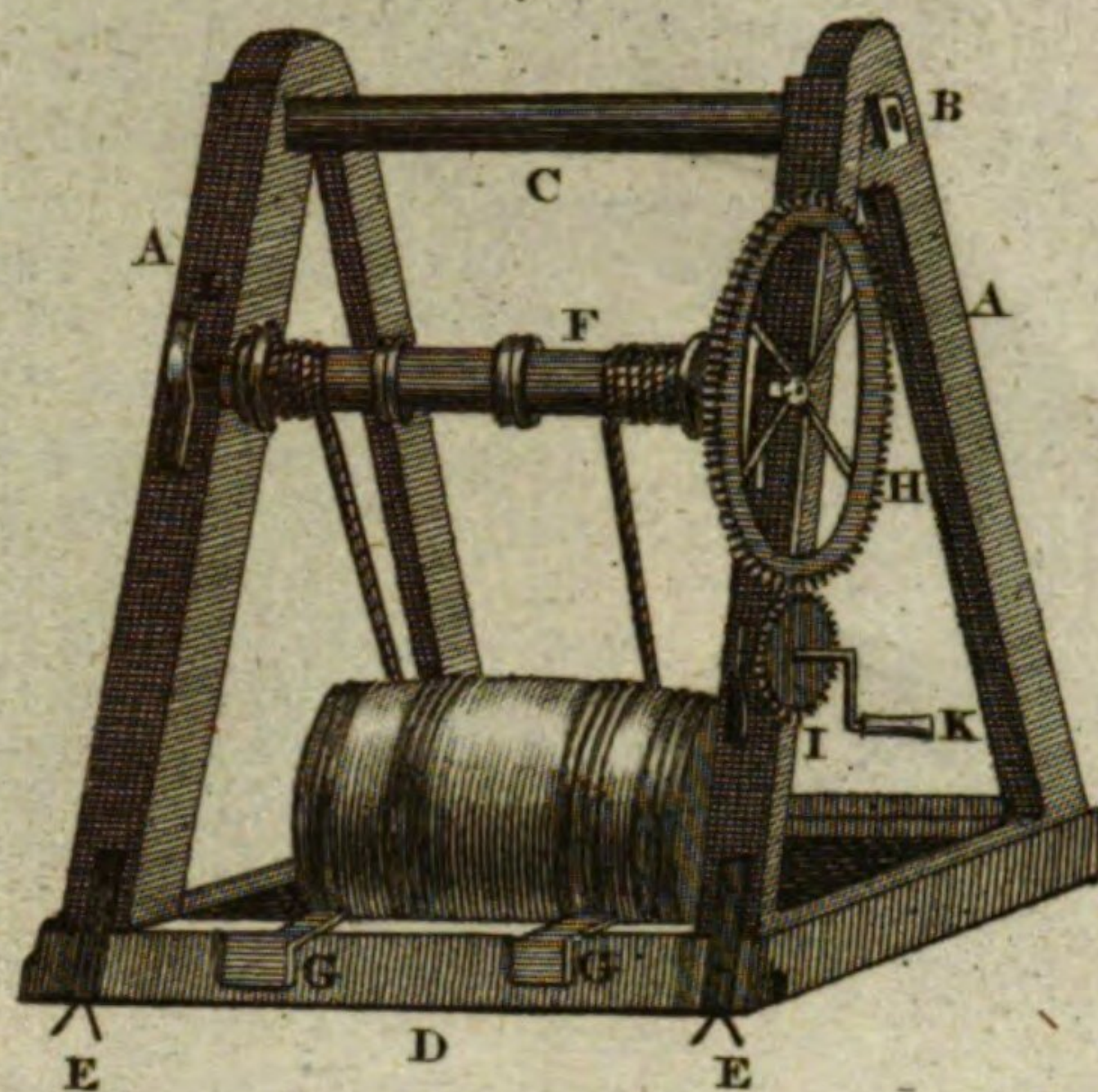
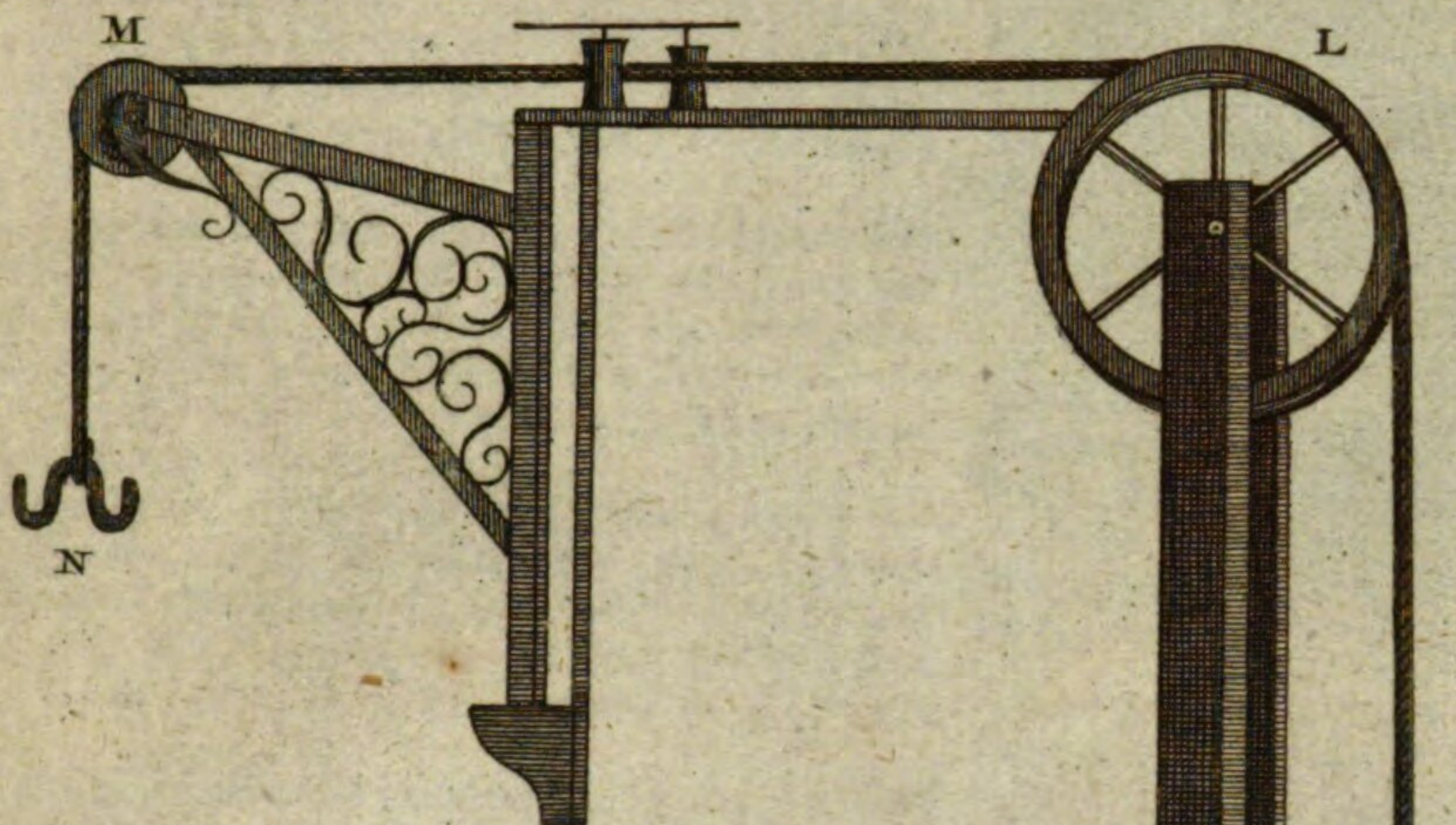


Fig. 61.

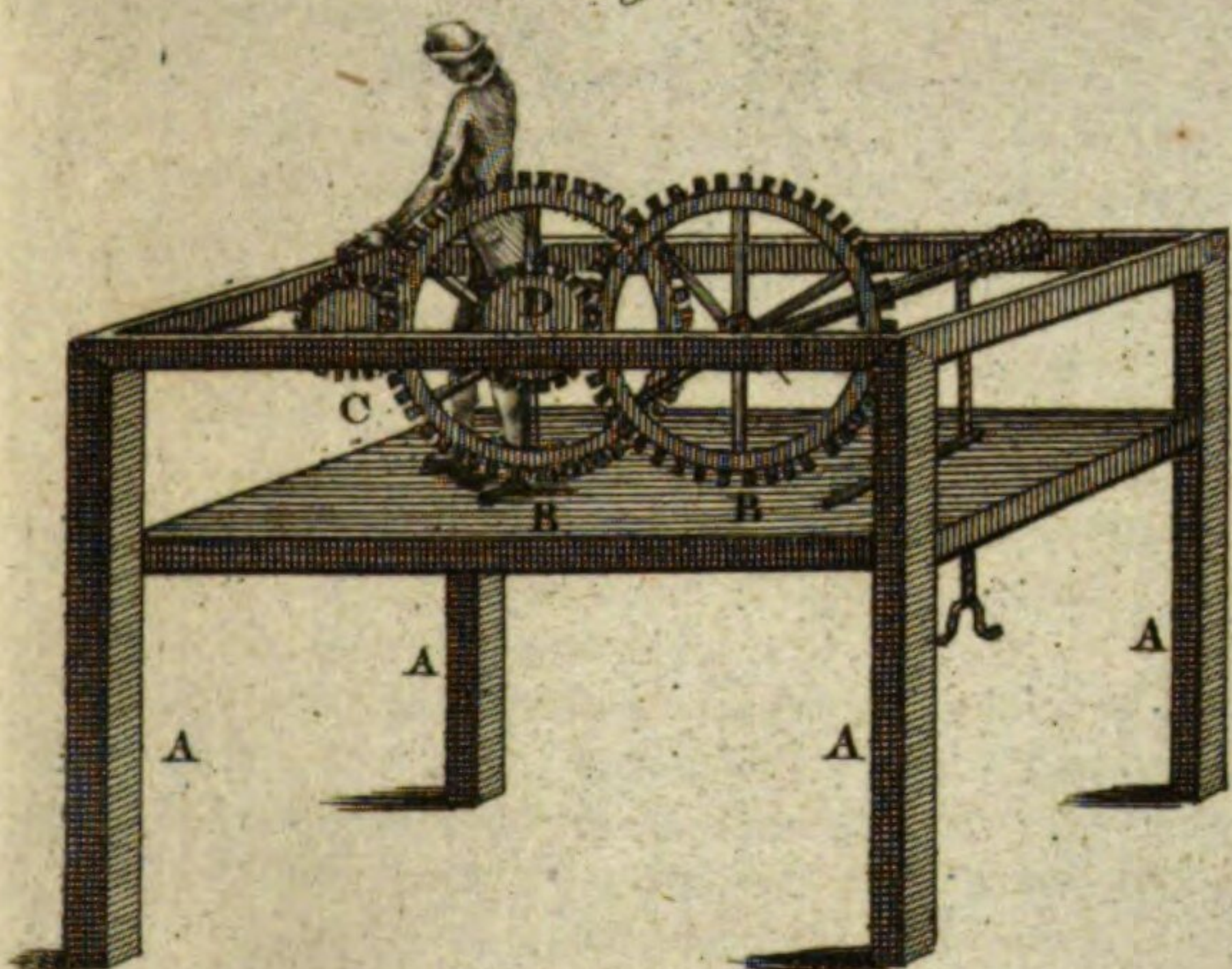
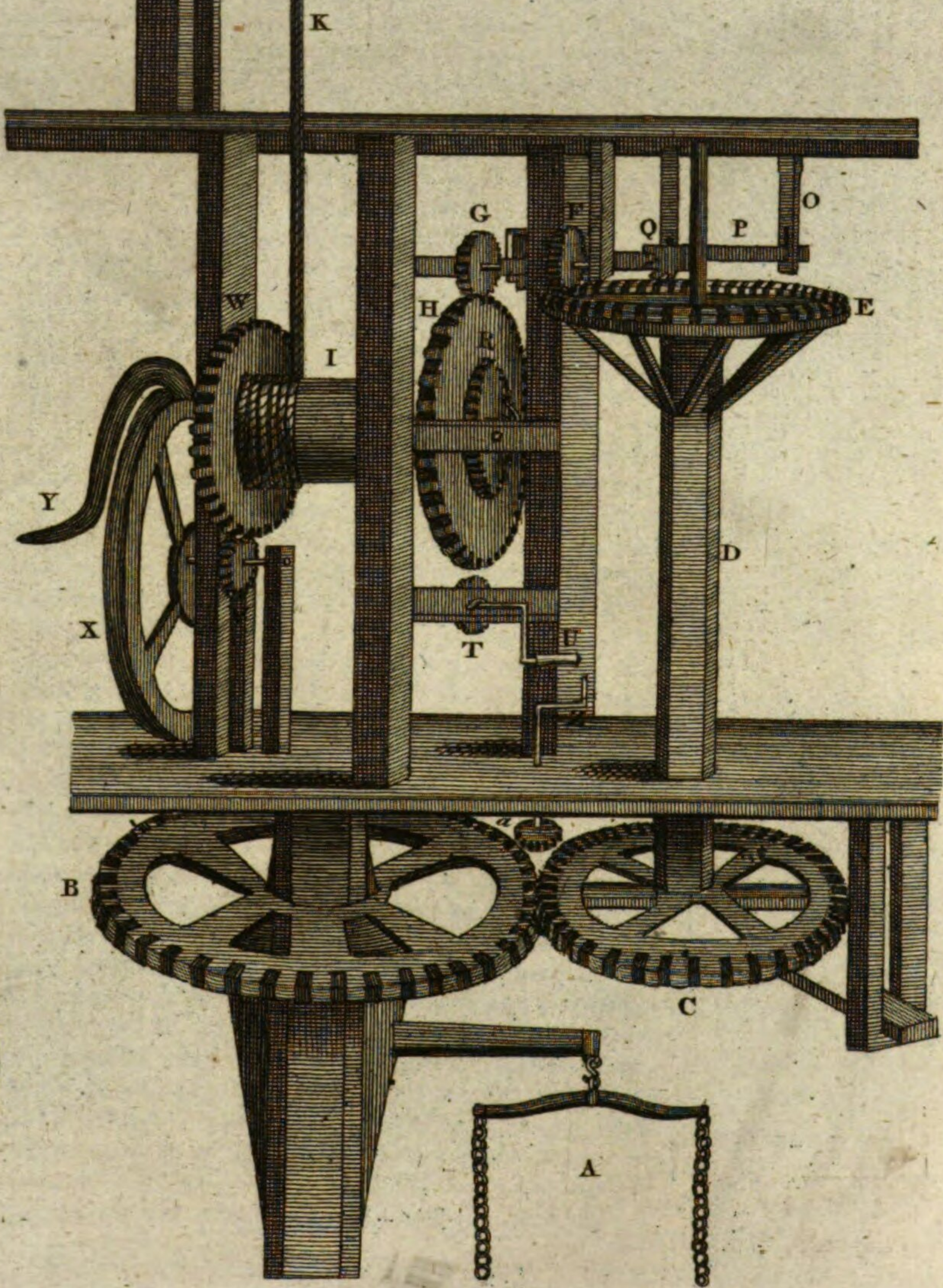
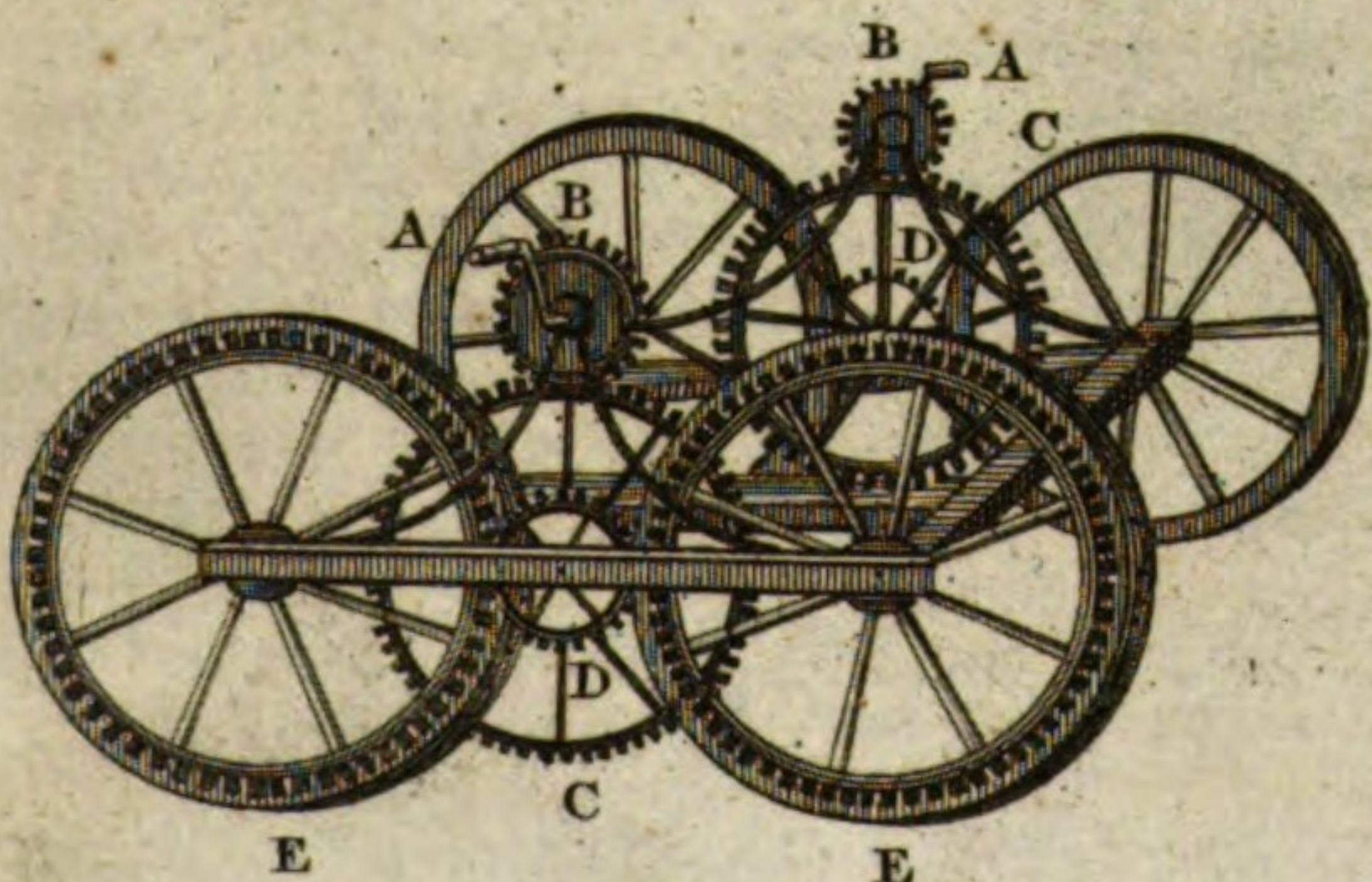


Fig. 62.



Combina-
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Powers.

Combina-
tion of Me-
chanical
Powers.

Plate
CCLXXXVIII.

and jointed together like a ruler at E. They are connected to each other by an iron round bar C and wooden bar at the bottom D. The iron prongs EE fasten the uprights steadily to the edge of the cellar; F is the axis round which two ropes are coiled, the ends of which are fastened to the two clamps GG. On the axis F is fixed the iron wheel H of 3 feet in diameter: in the teeth of this works the pinion I of about 6 or 7 inches in diameter, and is turned by the handle at K.

It is evident, by a bare inspection of the figure, that when the two ropes are slipt over the ends upon the barrel, either at the top or bottom of the cellar, that by turning of the winch K towards or from you, the barrel can be safely and expeditiously taken out or lowered down.

When the crane is done with, it shuts up by unscrewing the nut at B, taking the wheel and axis away out of the loops at L, and folding the sides at A together like a jointed rule; it may then be taken away in the cart or dray, or taken in the mens hands.

39
Portable
stone-
crane.

Fig. 61. represents a portable stone-crane mounted in a wooden frame and stage, which is judged to be very useful for loading and unloading carts with large heavy stones. It is moveable to any part of a stone-yard or ground; the frame is sufficiently wide for a cart to draw under the crane, and at any time it may be taken to pieces.

The frame AAAA is made of wood, is about 9 or 10 feet high, and about 9 feet square. The wheels BB are of iron, and are about 3 feet in diameter, and the pinion D, that is fixed to the axis of the first wheel B, 8 inches in diameter, on the axis of the second wheel B, the axis round which the rope-coils is fixed.

Now the stones being corded and hooked at the end of the rope, it is very evident that the man at C will either raise or lower them as may be necessary, according as he turns the winch towards or from him, and in a safe and very easy manner.

40
Crane car-
riage.

Fig. 62. is a representation of a crane-carriage which Mr Gottlieb conceives to be very useful in moving large stones in quarries, where carts and horses cannot be conveniently or at all managed. Its principle is evidently clear from a bare view of the figure. It consists only of two sets of crane-wheels applied to the two sets of wheels belonging to the carriage; so that two men, one at each winch AA, turning the pinions and wheels round, shall act upon the carriage-wheels and move it along. By their both turning forwards or backwards, the carriage goes accordingly; but if they turn contrary-ways, the carriage will be turned round; or partly so, as may be wanted.

The pinion B is 6 inches in diameter, which turns the wheel C of 3 feet diameter, on the axis of which is fixed the pinion D of 1 foot diameter, which works into 2 wheels E, E, of 3 feet 6 inches diameter, that are fixed upon the carriage-wheels, and give motion to the whole machine.

The friction of the axle-trees of these machines may be considerably diminished, by applying an improved axle-tree invented by Mr Gottlieb, which he calls the *anti-attribution axle-tree*, and for which he has a patent. It is formed from a steel-roller, from 4 to 6 inches

long, turning within a groove cut in the iron part of the axle; and the advantages discovered by experiments made by Mr Gottlieb will be seen by the small table subjoined. A section of this axle-tree is represented in fig. 65. where *a* is the axle-tree, *b* the groove, *c* the roller, *d* the cavity between the lower part of the tree and the box *e*. In figs. 66, 67, *f* represents the oil-vessel supplying it with oil, *g* the tube to convey the oil by, *h* the straps of ditto, *i* the fastening screws. Figs. 63, 64, give a side view of the axle.

Advantage of the anti-attribution axle-tree.

	Old axle-tree. Anti-attribution.			
	lb.	oz.	lb.	oz.
Coaches	65	0	only 19	0
Chariots, post-chaifes, &c.	49	1	17	6
Single horse chaifes and chairs	31	7	6	8
Waggons	78	0	33	0
Drays for beer	138	0	48	0

One general maxim to be kept in mind by all mechanics is, that whatever a machine gains in power it loses in time, even supposing friction were entirely out of the question. It must likewise be remembered, that in almost all cases where a machine gains by complication, it will lose one third by mere friction, unless its parts are made with an accuracy not to be expected. In some cases, however, a great power must be had; and in these we must have recourse to the most simple machines, which will lose only time, and but little power by friction; for the complicated ones waste both time and power to a great degree. There is not perhaps a better method of procuring a very great power than by combining a screw with a toothed wheel which acts as an axis in peritrochio, as is represented fig. 50; for by making the threads of the screw pretty close, and the diameter of the wheel large, we may increase the power almost to any degree we please, without any considerable increase of friction. In this case, where it can conveniently be done, it is better to increase the diameter of the wheel than to add another, for this augments the power without any sensible augmentation of the friction; and it is absolutely necessary to have the axle as small as can be made of sufficient strength to bear the weight. Archimedes is said to have boasted, that he could move the earth provided he could find a place to stand on; and Bishop Wilkins, that he could pull the strongest oaks up by the roots by means of a single horse-hair. But abstracting from the impossibility in the case of Archimedes, it does not appear that the bishop could more easily have fulfilled his task, on account of the immense friction of the machine he must have employed, and the stiffness of the great ropes which must have been bent in order to accomplish his purpose. To perform feats of this kind, a lever seems more likely than any thing; but the vast room it takes up, and the excessive length requisite to make it act with sufficient force, together with the vast weight it must necessarily have if made of the requisite strength, must easily convince us that all such extravagant boasts are vain, and that wherever great effects are to be accomplished, a great power must originally be applied.

Plate
CCLXXXV.

Wheel-carriages.

SECT. IV. *Of Wheel-carriages.*

Wheel-carriages.

41
Sledges
used before
wheel car-
riages.

Wheel-carriages in general signify all kinds of machines furnished with wheels, for drawing great weights by means of the strength of animals or otherwise.

It is very probable, that in the infancy of the arts, sledges were used before wheels were invented, or at least before the application of them became very general. Homer mentions them as employed in bringing wood for the funeral of Patroclus; though it is not to be doubted that the Greeks at that time were acquainted with the use of wheels, as the same poet mentions them on all occasions when speaking of the war chariots of his heroes. It is possible, therefore, that by the country people, for inferior purposes, the sledge might be employed, while wheel-carriages were confined to those of superior rank, or used only for war-chariots. It is not long ago indeed since sledges were used for certain purposes in our own country, notwithstanding the number of wheel-carriages used in it from time immemorial. In some of the cold countries, where ice is met with in great quantity, and the ground is covered with frozen snow for a great part of the year, sledges are still used, and run upon the smooth surfaces of these bodies with as great ease as wheels run upon the ordinary ground. Upon very smooth ice, indeed, or upon any body perfectly smooth, wheels would not turn at all; for the only reason why they turn in the ordinary way, is the continual inequality they meet with. If we suppose the wheels to be carried in the air, it is plain that they would not turn, there being nothing to put any part in motion more than another; and the same would be the case if we could suppose ice, or any other body, to be so smooth that it would give as little resistance as air. On common roads, however, the wheels meet with obstructions at the bottom, which retard that part; and in consequence of this the upper part moves forward, and a circulating motion immediately begins to take place. By means of this circulatory motion the friction becomes very much less than what it would be if the weight were drawn along the ground upon a sledge, inasmuch that, according to the computation of Dr Henshaw, a four-wheeled carriage may be drawn with five times as much ease as one that slides upon the same surface as a sledge.

42
Obstacles
which occur
to the
motion of
carriages.

The structure of wheel-carriages is so generally known, that it is needless to describe them. In the construction of them, however, there are several particulars to be observed, which may render one method of construction preferable to another, though there may be a general similarity between one carriage and another. In order to ascertain the most proper method for constructing them, it will first be necessary to consider the obstacles which occur to their motion. These are,

1. The *vis inertia* of matter.—This, though for a considerable time supposed to be a principle of mere *inactivity*, or *resistance* to any change of state from motion to rest in material bodies, is now almost exploded. Mr Anstice, in a late treatise on wheel-carriages, supposes the philosophers who maintain the existence of such a principle, to have mistaken Sir Isaac Newton and other great men. According to him, they meant no more by the *vis inertia* of matter than a mere passiveness in it, by which it was disposed to abide

in that state, either of rest or motion, in which it originally was; “whereby it alters not its state but in proportion to the quantity of power exerted against it. Thus, should a body of any given weight or quantity of matter, moving with a certain degree of velocity, strike another body at rest of the same weight, it would communicate half its motion to that body, and they would move together with the same velocity as the first: but this proceeds from no principle of the body at rest to resist motion, it does not destroy in the other more than it receives from it; therefore no motion is lost, it is only divided; and the two after division have a power equal to that of the one before it, with the whole velocity of motion. Indeed when we consider that the least degree of motion in any body, however small, will communicate some degree of it to the largest in the universe; and that, on the contrary, none but an equal degree of impetus can deprive a body of actual motion, and that immediately opposed to it: add to this, that since all matter within the reach of our observation, and by analogy we have reason to think it is in actual and rapid motion, impressed on it by its great Creator, and co-existent with it; we may conclude, that if matter do not affect, it is more liable to motion than to rest.”

2. *Friction*. By this is meant the quantity of motion destroyed by bodies sliding over one another, and which is in proportion to the weights laid upon them. See Sect. II. § 8.

Friction depends not only upon the pressure made on the moving bodies, but on the inequalities on the surfaces upon which they move. For as the surfaces of even the most highly polished bodies have some inequalities, whenever two of them are pressed together, the inequalities of the one must enter, and in some degree accommodate themselves, to those of the other; and as the forms of these inequalities are of infinite variety, it is impossible to give any general description which can exactly answer to every one of them.

Mr Anstice supposes the varieties only to be of two kinds, which he thinks may not be very dissimilar to any that occur. 1. Let us imagine two sliding surfaces, when viewed through a microscope, to present such an appearance as is represented in fig. 69. in which A is the sliding body to be moved in the direction CD over the fixed body B. To effect this, it is evident, that either the teeth must be violently broken off, or a power applied to them sufficient to make them slide upon each other on the principles of the inclined plane; in which case the friction must always be in proportion to the weight of the slider, and that with which it is loaded, without regard to the length or breadth of the bearing surface: for if only one pound rested upon one tooth, there would be no more but that pound to be lifted. If the pound rested upon two teeth, there would only be half a pound to be lifted over each, and so on to any number; but if we suppose the teeth to be of such a shape, that they cannot act as inclined planes, let them be ever so strong, we must calculate the friction in a different manner.

Let surfaces of this kind be represented by fig. 70. In which case it is evident, that instead of depending on the weight or pressure only, it will be in proportion to the number and strength of the teeth so locked

Wheel-carriage.

ed together; or, in other words, on the length and breadth of the rubbing surfaces. On this supposition the weight of the slider will have little or no effect in breaking the teeth, or hindering its being done by the power applied in the longitudinal direction; but if one tooth is to be broken, it will be necessary to apply twice that power to break two, thrice the power to break three, &c. Hence it is evidently impossible to form any general rule concerning the friction which takes place on this principle. As experience, however, has shown that two bricks, or other bodies of that kind, are almost as easily drawn along a table when placed side by side, as when laid upon each other, it seems probable that such a locking of parts seldom occurs; and when it does, the obstacles are soon broken down. Yet it is certain, that some such thing must take place on all occasions, otherwise the wearing of bodies which rub upon one another could not happen.

From what has been said it must appear plain, that if a slider be laid upon an horizontal plane, it must remain at rest; though by a very small force, such as is barely sufficient to overcome the friction, it will be set in motion; because, on a plane quite horizontal, the motion of any body does not remove it in the least farther from the point to which it is attracted by the force of gravity. If the plane be inclined to the horizon, then, besides the power necessary to overcome the friction, it will be necessary to have one sufficient also to overcome that of gravity, by which it is determined to roll down the plane; the proportion of which is ascertained under Sect. II. § 4. The difficulty of raising great weights in this manner, however, where the ascent is steep, and the ways rough, must necessarily be so great, that sledges could not be used with any advantage, and therefore wheels are indispensable.

The advantage of wheels over sledges may be further understood from the following considerations. 1. A sledge, in sliding over a plane, suffers a friction equivalent to the distance through which it moves; but if we apply to it an axle, the circumference of which is six inches, and that of the wheels eighteen feet, it is plain, that moving the carriage eighteen feet over the plane, the wheels will make but one revolution; and as there is no sliding of parts between the plane and the wheels but only a mere change of surface, no friction can take place there, the whole being transferred to the nave acting on the axle, so that the only sliding of parts has been betwixt the inside of the nave and the axle; which, if they fit one another exactly, is no more than six inches: and hence it is plain, that the friction must be reduced in the proportion of one to thirty-six. Another advantage is also gained, by having the surfaces confined to such a small extent; by which means they may be more easily kept smooth, and fitted to each other. The only inconvenience is the height of the wheel, which must in all cases be added to that of the carriage itself.

It has been a matter of no little consideration, whether the wheels of a carriage ought to be small or large; and this subject Mr Anstice has treated in a very particular manner. He observes, that in the overcoming of such obstacles as are commonly met with in roads, wheels act as mechanical powers, and therefore the size of the wheel must be regulated upon the

principles of these powers. Thus, let the circle O T A G L, fig. 71, represent a wheel of four feet diameter, placed on the level P Q, and opposed in that line by the obstacle O, which is supposed to be 7.03 inches in height; the line in which the carriage is drawn being C T, parallel to the plane P Q. In this case the effort applied to the carriage is communicated to the nave of the wheel where it touches the axle. This part, therefore, represents the part of the lever to which the power is applied, and is the point C in the figure. As the turning point is that where the wheel touches the obstacle, that must represent the fulcrum of the lever; whence that arm of the lever will be represented by CO, which may be supposed a spoke of the wheel: and as the upright spoke C L is in the line which bears the whole weight from the axle, and in which it is to be lifted; hence that part of the circumference of the wheel which is between the fulcrum and the upright spoke bearing on it, must represent the arm of the lever which is to raise the weight. In this case neither the weight nor the power act at right angles to their respective arms of the lever; so that we must represent their powers by the imaginary lines MO and ON. As the length of OM, therefore, is to that of ON; so is the proportion required to the weight to balance it on the obstacle, when rising over it; and in this case the arms are equal, it is plain that the powers must be so likewise. Every obstacle, therefore, exceeding this height, which is as 7.03 to 48, will require a power acting parallel to the plane greater than the weight drawn; and every obstacle whose height bears a smaller proportion to that of the nave, must be overcome by a smaller power.

Again, let a wheel of four feet diameter be represented by the circle in fig. 72, and supposed to be moved along the plane P Q, and an obstacle of twelve inches height be placed before it, the real lever will then be represented by the lines L O C; which being reduced to the imaginary ones MON, shows that the power is greater than the weight. By the same rule, if an obstacle of three inches be placed in the way of a wheel, as in fig. 73, the power required to move the wheel will be considerably less than the weight, though it is plain that the proportion of power must always be according to the size of the wheel, the height of the obstacle, and the direction in which the carriage is drawn. For instance, if the line of traction in fig. 73. be raised into the direction CS, the power required to move the carriage over it will be to the real weight as the line CO is to the line ON; and in consequence of thus altering the direction, we gain as much as the length of the line CO exceeds that of CN.

This view of the manner in which the wheels of carriages act, will serve to elucidate the question, whether large or small wheels are preferable for carriages? Let the circle fig. 74. represent a wheel of two feet diameter, and the obstacle in its way 7.03 inches in height; then will the true lever be represented by the lines COL, to be reduced to the imaginary ones MON. In this case, the power required to draw the carriage must be to its weight as NO is to OM, which is more than double; and thus the advantage of large wheels over small ones is evident. In this, however, as in all other cases where wheels act as mechanical

Wheel-carriages.

43
Whether large or small wheels are preferable.

Wheel-carriages.

nical powers, we must remember, that the same doctrine applies to them as to the powers themselves when used in any other manner, viz. that as much as we gain in power we lose in time; and therefore, though a wheel of twice the diameter may be raised over an obstacle of any given height with twice the ease that would be required for one of once the diameter, yet the large wheel would require twice the time to move over it that the small one does.

Hitherto we have considered the carriage as being drawn in a direction parallel, or nearly so, to the plane on which the wheels move, which line is supposed to be horizontal: but the case will be different when we suppose them to move upon an inclined plane; for then, even though the line of traction be parallel to the ascending plane, and though the wheels act as levers, we shall find that the action of the weight will increase with the power gained by the increase of size in the wheels; and consequently, that the increased size of the latter will be of no farther use than that of diminishing the friction, in the same manner as is done upon horizontal planes.

To illustrate this, suppose the larger circle in fig. 75. to represent a wheel of four feet diameter, and the smaller circle a wheel of only two, both of which are made to ascend the inclined plane LM, by powers applied in the directions GI and ES parallel to the elevation of the plane, which is 45 degrees; it will then be found, that by describing the lever as in the former case, though the arm of the lever to which the power is applied be double the length in the large wheel that it is in the small, the other is augmented in the same proportion. Neither will the powers be augmented by varying the direction of the line of traction; for while these are kept parallel to one another, their relative powers must always keep the same proportion to one another. The reason is obvious, viz. that when wheels of any dimension ascend or descend inclined planes of any regular elevation, the fulcrum of the lever contained in the wheels must be determined by that part of the wheel which touches the plane, and which must always be of a proportionate height both in large and small wheels. It is otherwise, however, with the fulcrum marked out by perpendicular or irregular obstacles upon the plane itself; for large wheels will always have the advantage over small wheels when these are presented, for the reasons already given. Indeed, when the wheel impinges perpendicularly upon an obstacle as high as the line of traction, it is plain that it cannot be drawn over it by any power whatever, unless the direction of the latter be altered.

44
General
conclusions
concerning
the motion
of carriages.

From these considerations, our author draws the following conclusions: 1. That in a carriage placed upon an horizontal plane, nothing more is required to produce motion than to overcome the friction which takes place between it and the plane. 2. By the application of wheels to a carriage, the friction is lessened in the proportion of the diameters of the axles and hollow parts of the naves to those of the wheels. 3. In the draught of a carriage without wheels up a regular plain ascent, the friction must not only be overcome, but there is a power likewise to be applied sufficient to lift such a proportion of the weight of the carriage as the perpendicular part of the ascending plane bears to that portion of the plane. 4. If wheels of any size

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be applied to the carriage in such circumstances, they have only the advantage of lessening the friction; for though they really act as levers, yet as each arm of the lever is lengthened in proportion to the increase of size in the wheels, the power can be no farther augmented than as the ascent may act as a mechanical power for raising up the wheels, carriage, &c. to the top. 5. Large wheels have the advantage over small ones in overcoming obstacles, because they act as levers in proportion to their various sizes. 6. The line of traction, or that in the direction of which the carriage is drawn, should always, if possible, be parallel to that in which the plane lies; for when this is the case, the arm of the lever to which the power is applied will bear the longest proportion possible to the other. This always takes place when the line of traction is perpendicular to that spoke of the wheel which points to the obstacle. As it may not always be possible, however, to alter the direction of the line of traction to this position, it will be most proper to fix upon some medium betwixt that which commonly occurs and that which requires the greatest exertion to overcome the obstacle; that is, betwixt a level line and one rising perpendicular to the spoke of the wheel which points to the obstacle it is likely to meet with. The greater attention ought to be paid to this last, that all wheels, but especially small ones, are liable to sink into the ground over which they pass, and thus produce a constant obstacle to their own progress. The line of traction, it must also be observed, is not an imaginary one drawn from that part of the animal to which the traces or chains are attached to the axle of the wheel, but the real direction of the traces to whatever part of the carriage they are attached; for the effort will be instantly communicated in the same direction from one part of the carriage to all the rest, by reason of the whole being fastened together and in one piece.

Hitherto we have considered the whole weight of the carriages as bearing perpendicularly against the axles of the wheels: but as this cannot be done in chairs, carts, and other carriages having only two wheels, it will be necessary to have their centres, or transverse lines of gravity, as near to the ground as possible. To understand this, it must be premised, that the centre of gravity is that point of any body which if suspended will keep all the parts of the body at rest, let the body be placed in any situation we please. Thus the centre of gravity in a wheel or circle is the centre of the circumference, provided the substance of it be equably ponderous throughout. In like manner, the real centre of a globe coincides with the centre of gravity, provided the matter of which it is composed be equably ponderous. In a square, whether superficial or solid, the centre of gravity will be a point equally distant from all its sides; so that if the substance be equably heavy, it will be impossible to turn it into any position in which there will not be as much matter upon one side of the centre as upon the other: and in like manner, every figure, however irregular, has some point round which, if it be turned, as much matter will always be upon one side as on the other.

If now any body be supported by a transverse line passing not through the centre of gravity itself, but either

Wheel-carriages.

Fig. 63.

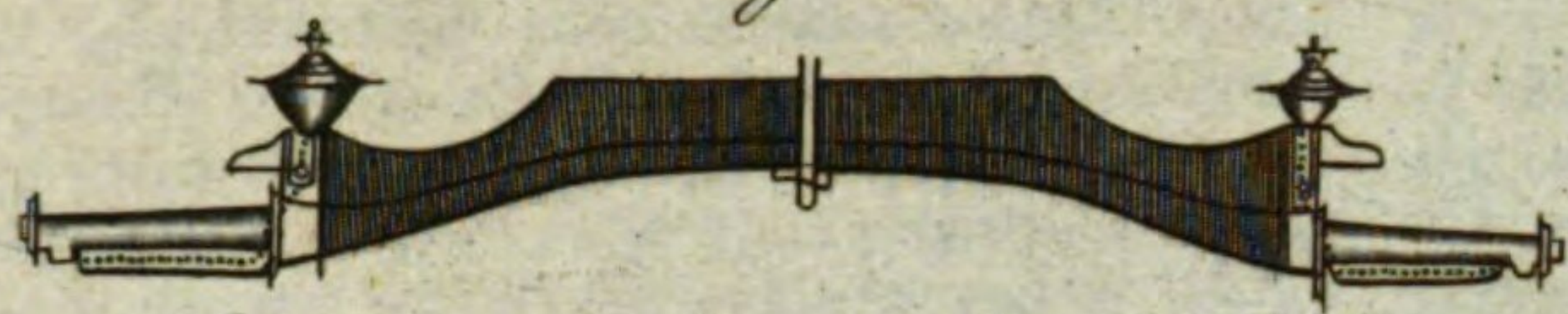


Fig. 64.

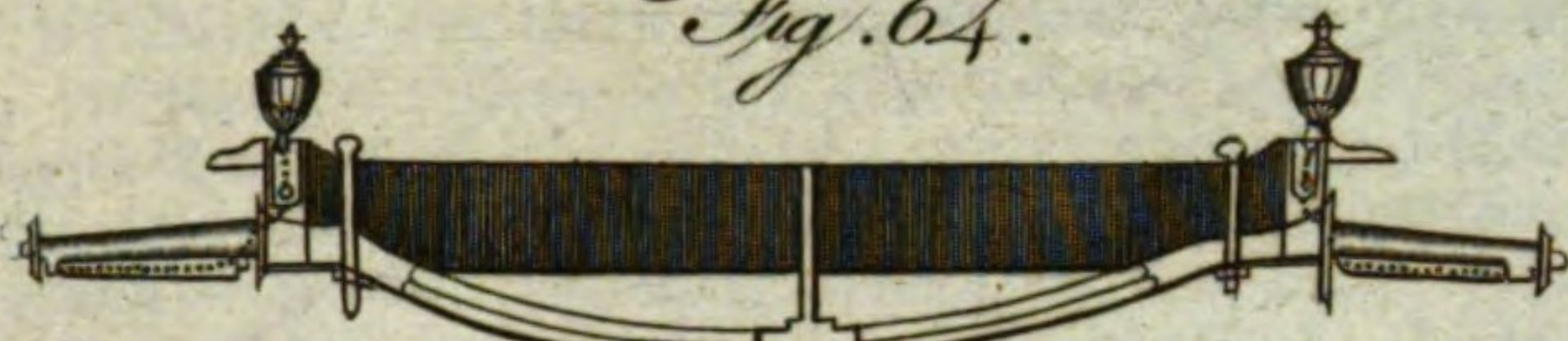


Fig. 67.



Fig. 65.

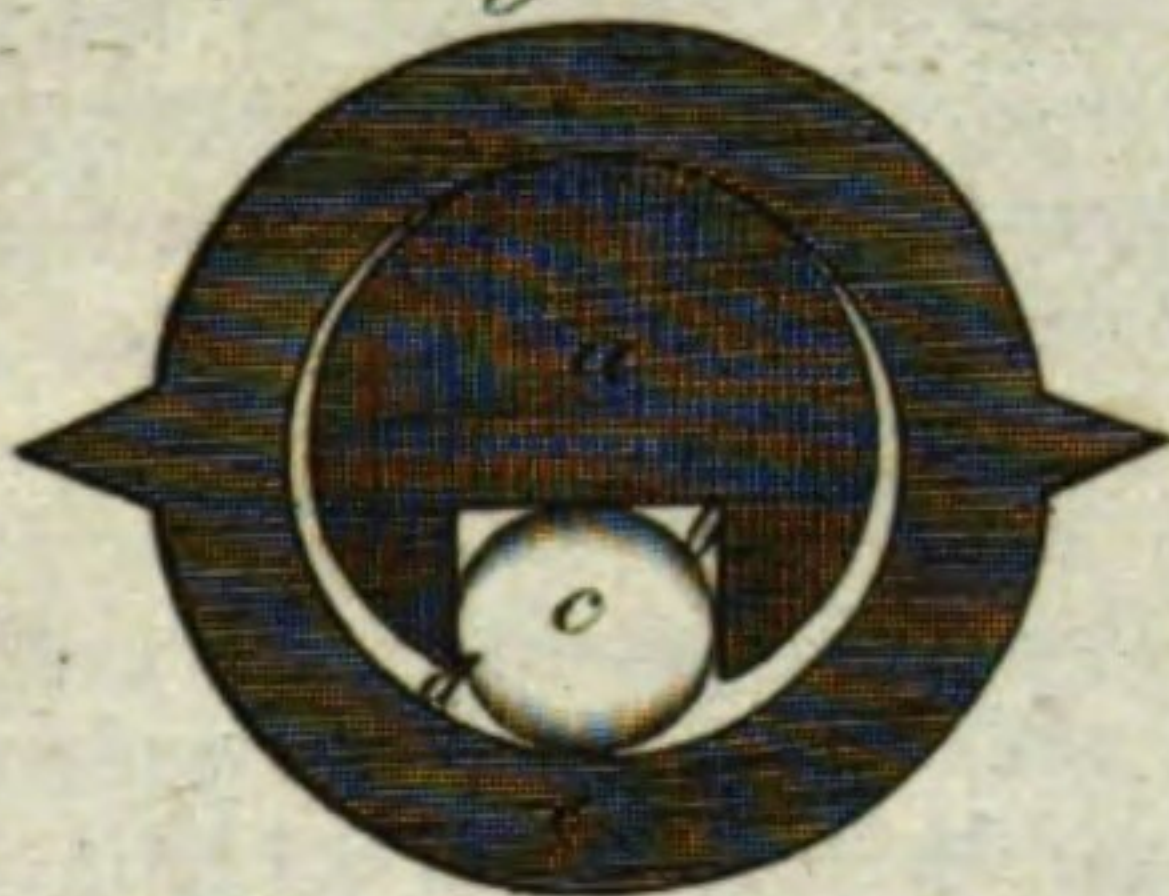


Fig. 66.



Fig. 68.

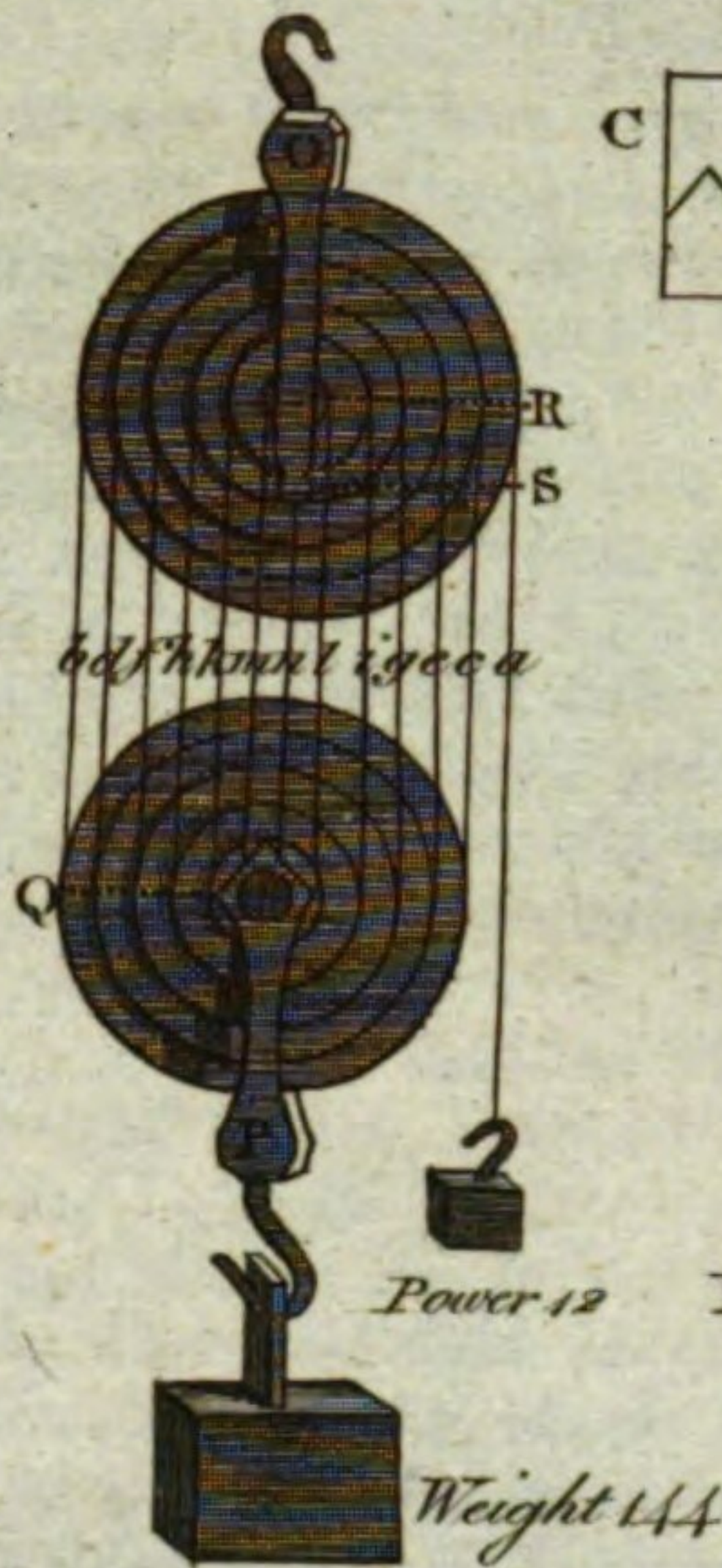


Fig. 69.

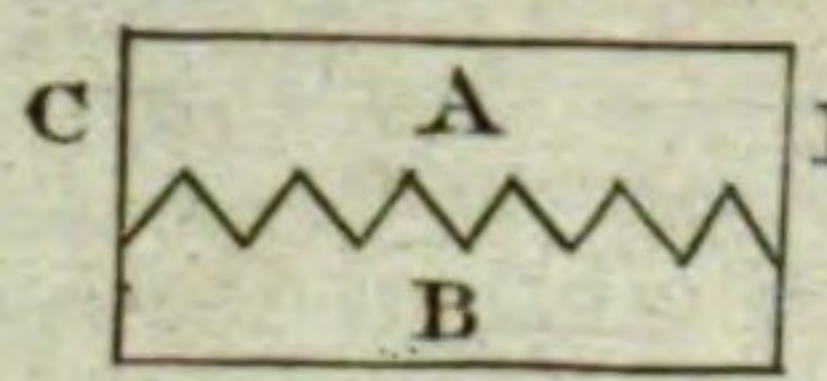


Fig. 70.

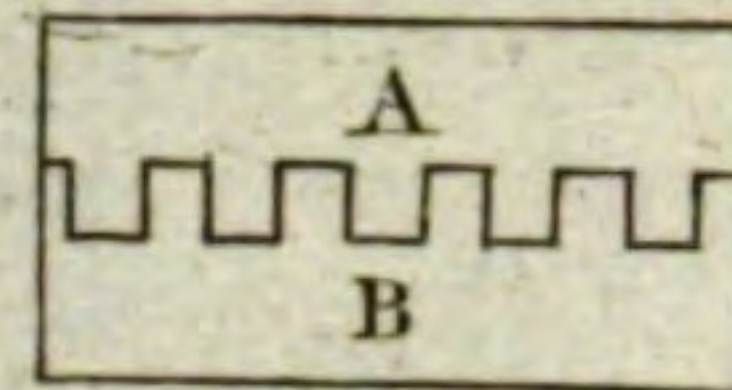


Fig. 78.

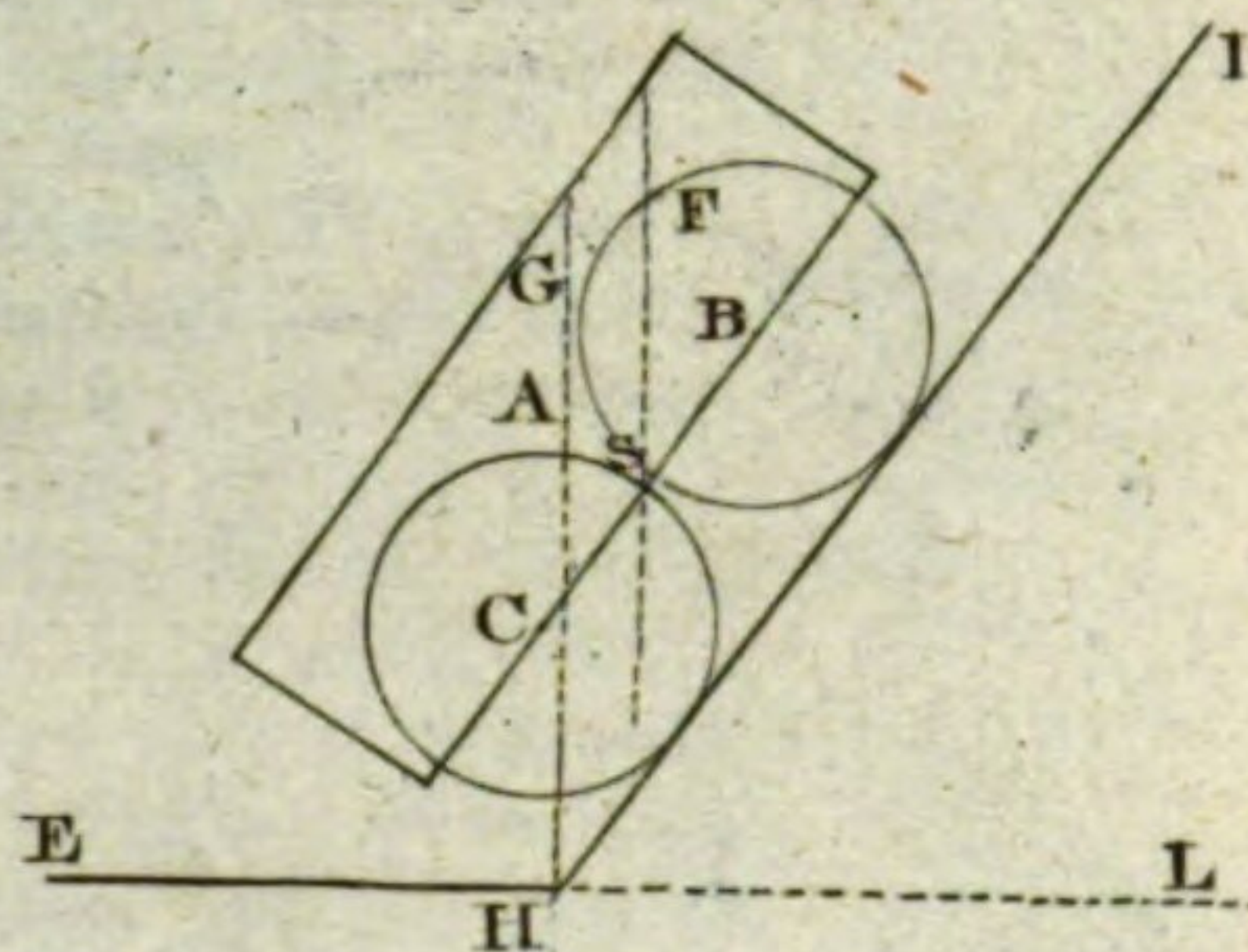


Fig. 72.

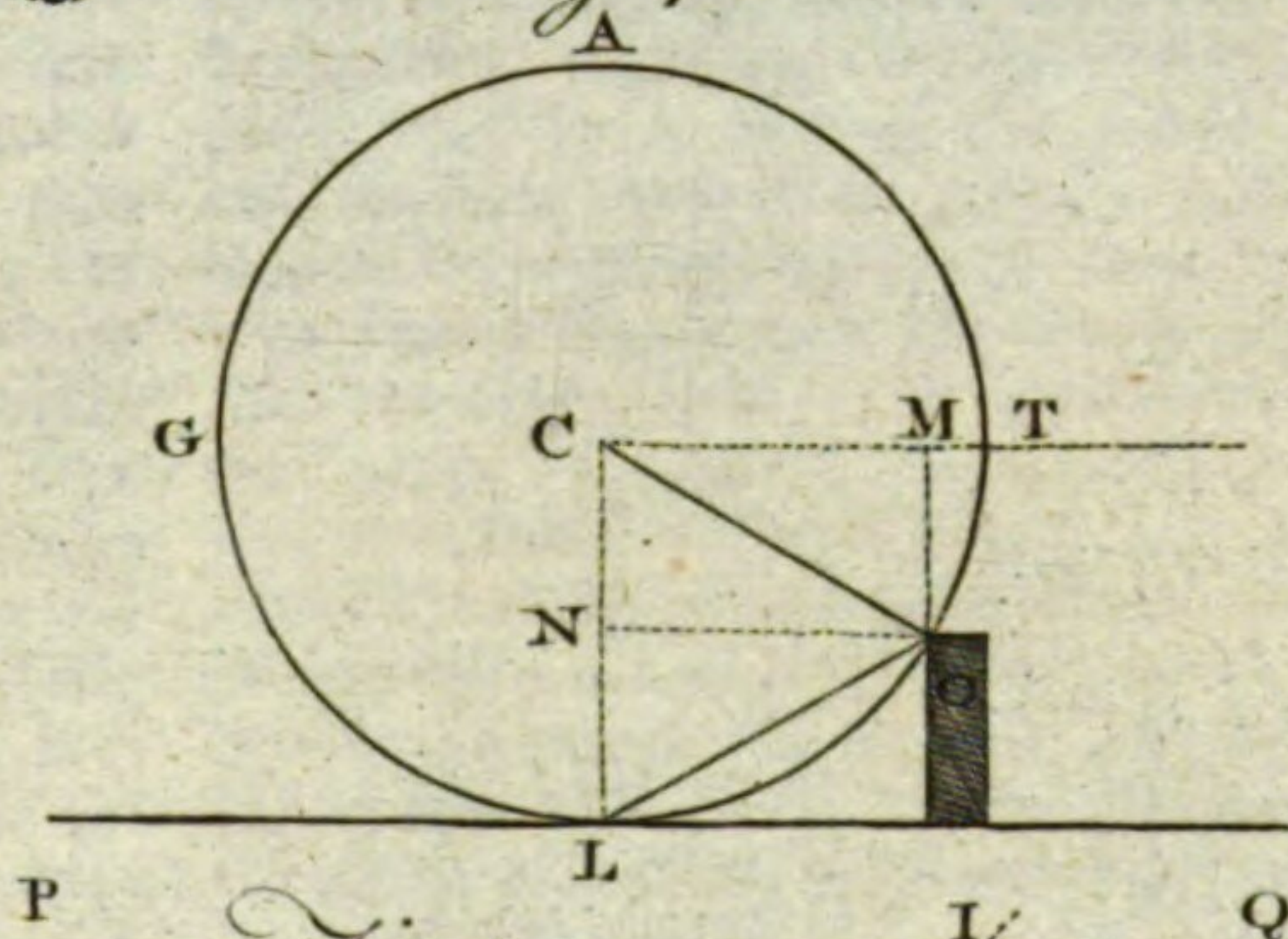


Fig. 77.

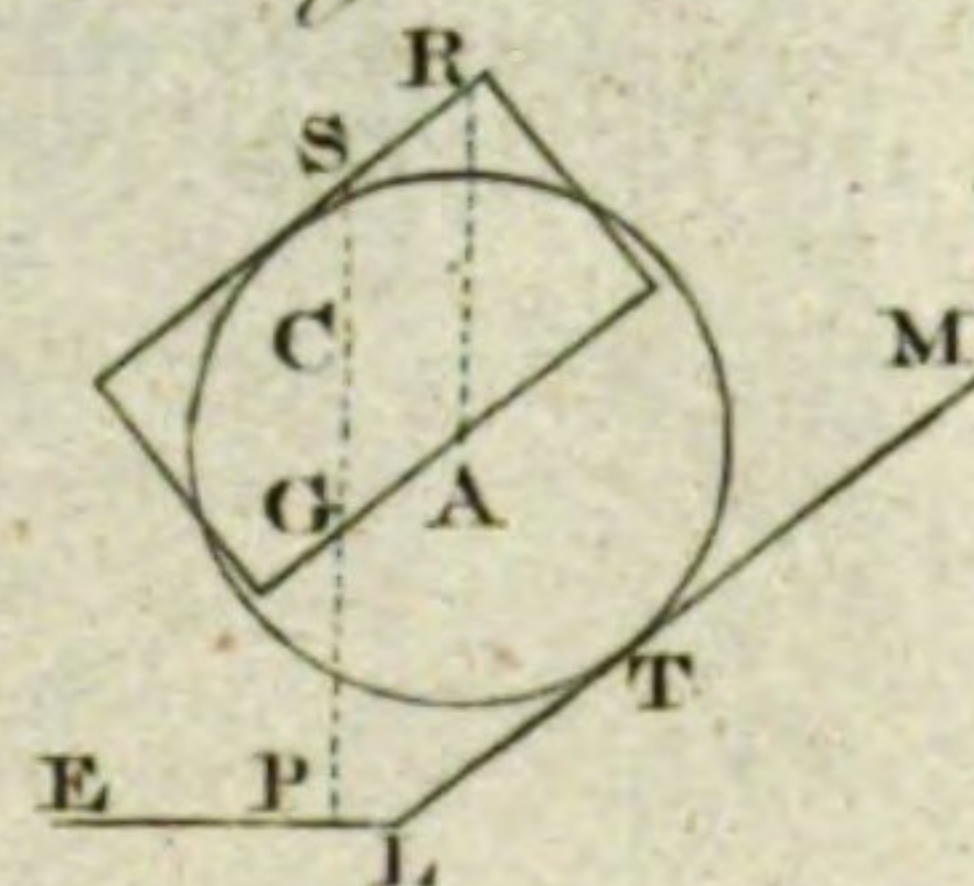


Fig. 76.

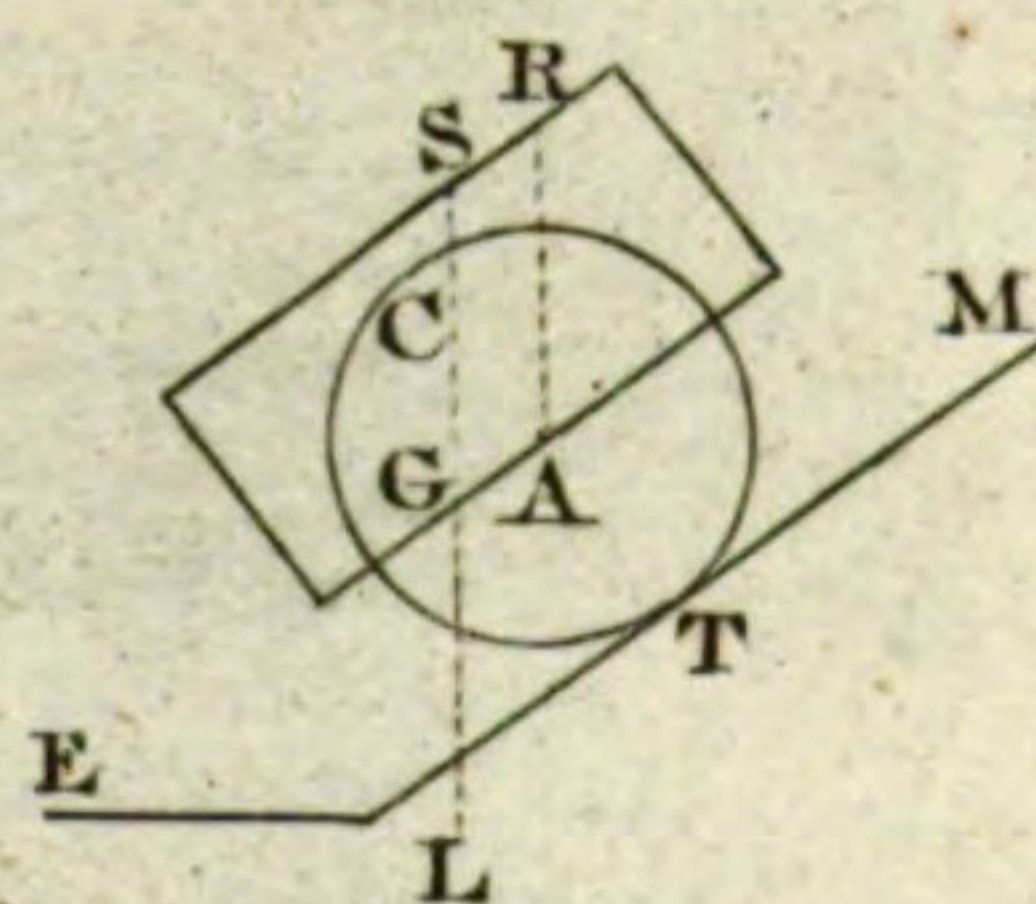


Fig. 71.

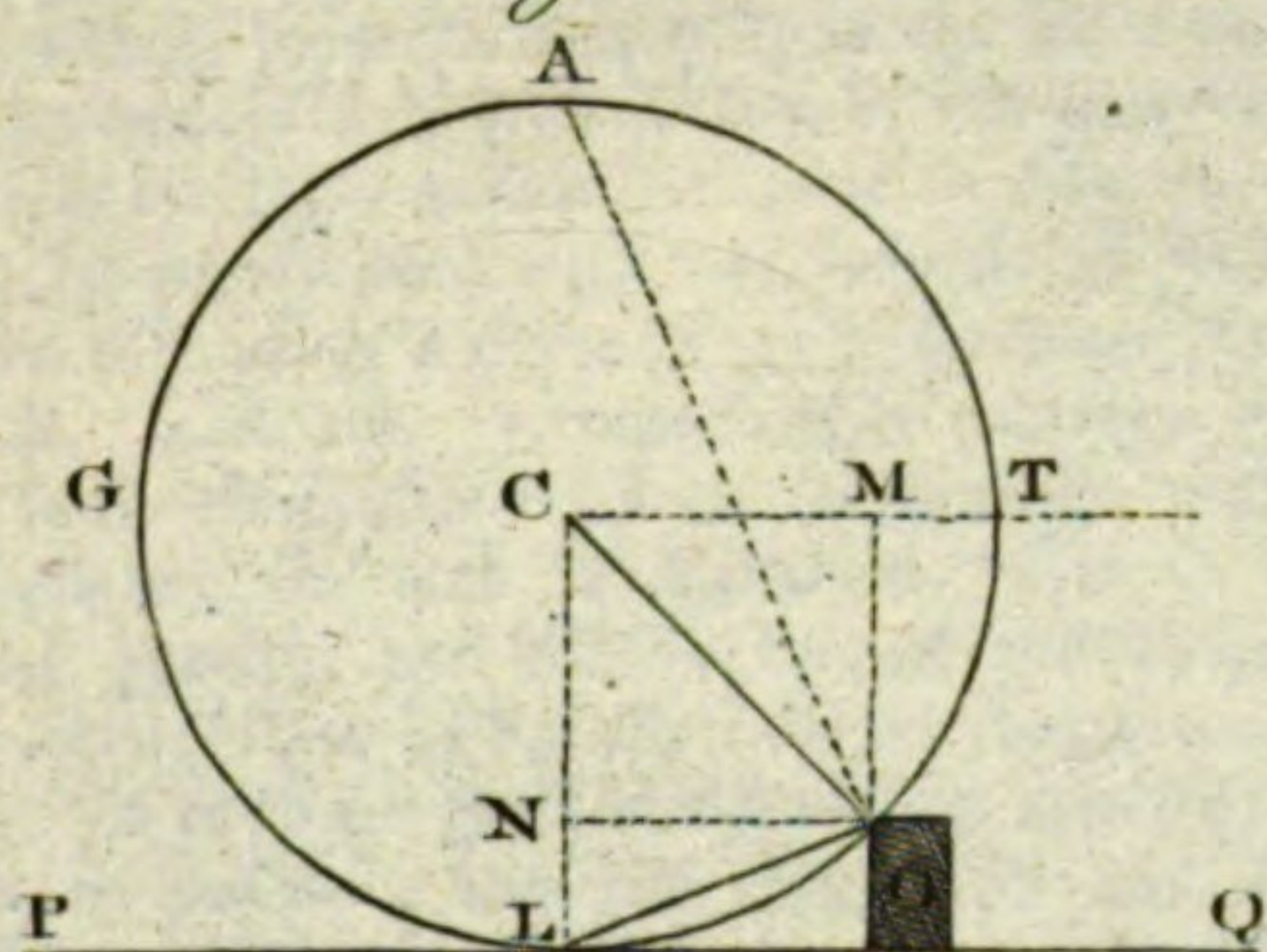


Fig. 75.

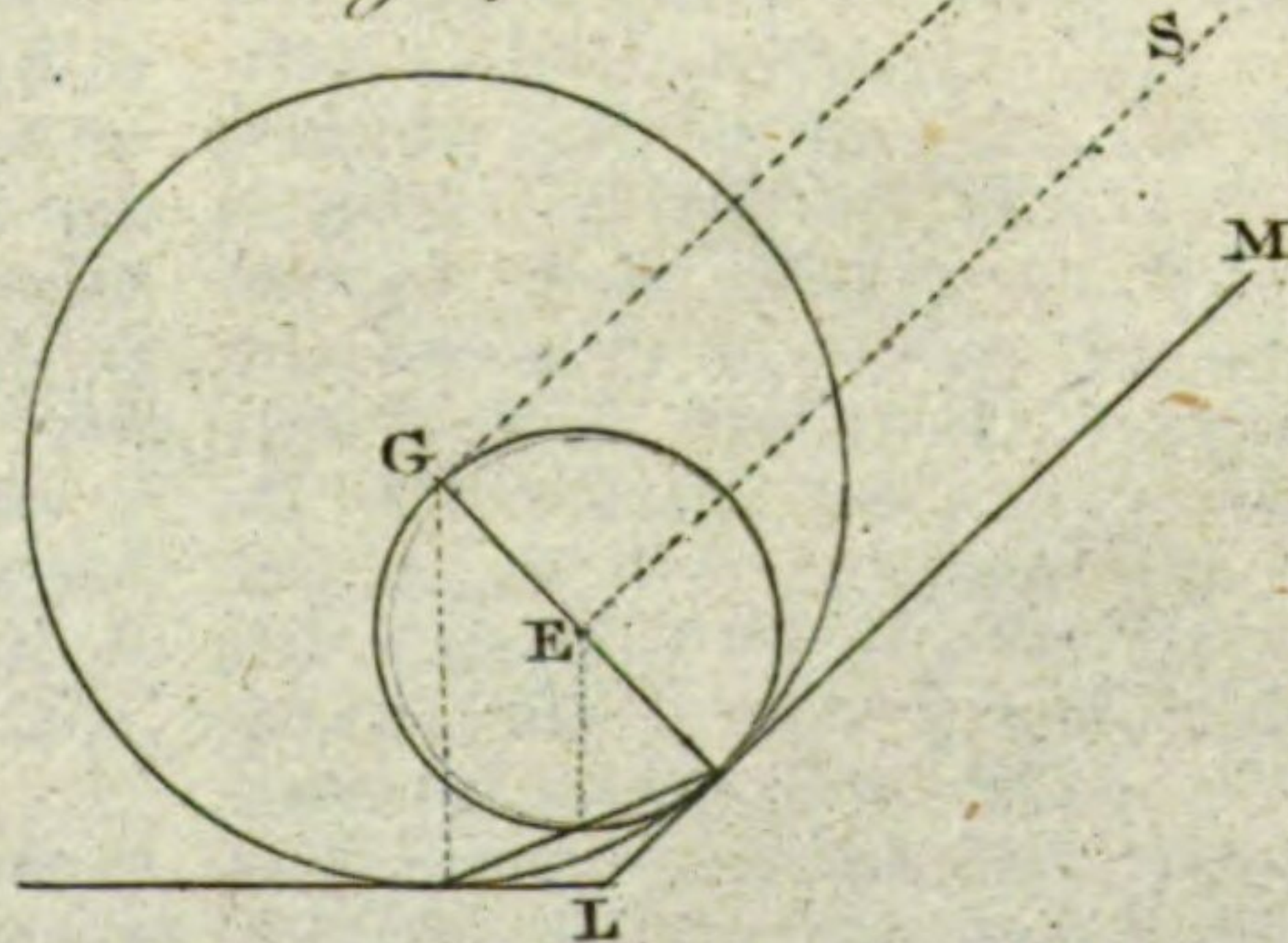


Fig. 79.

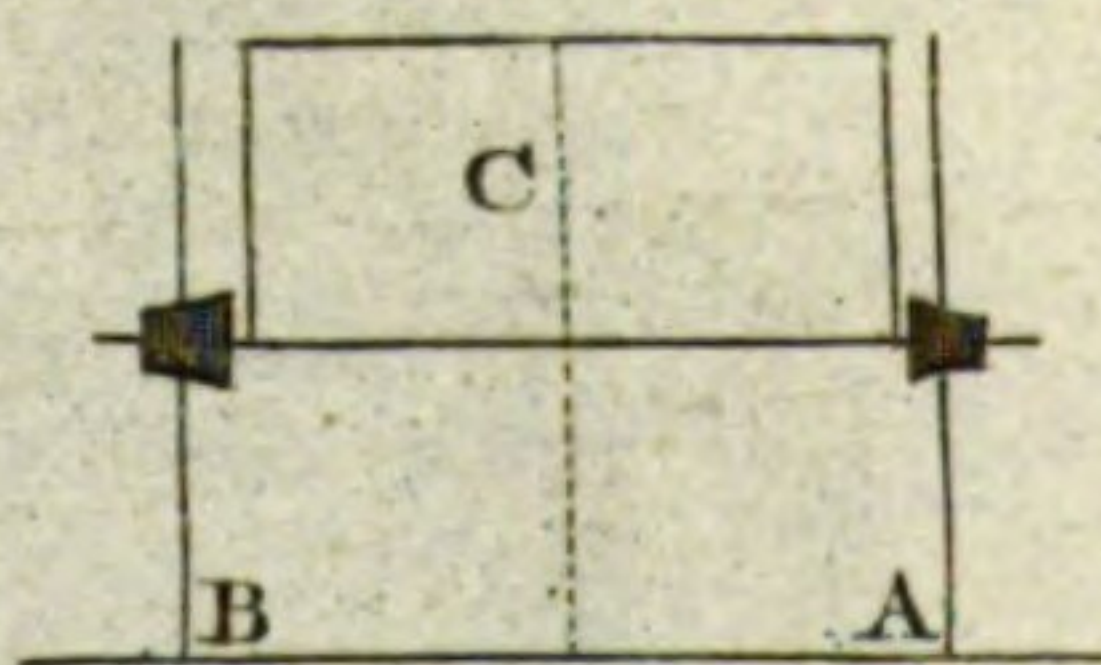


Fig. 73.

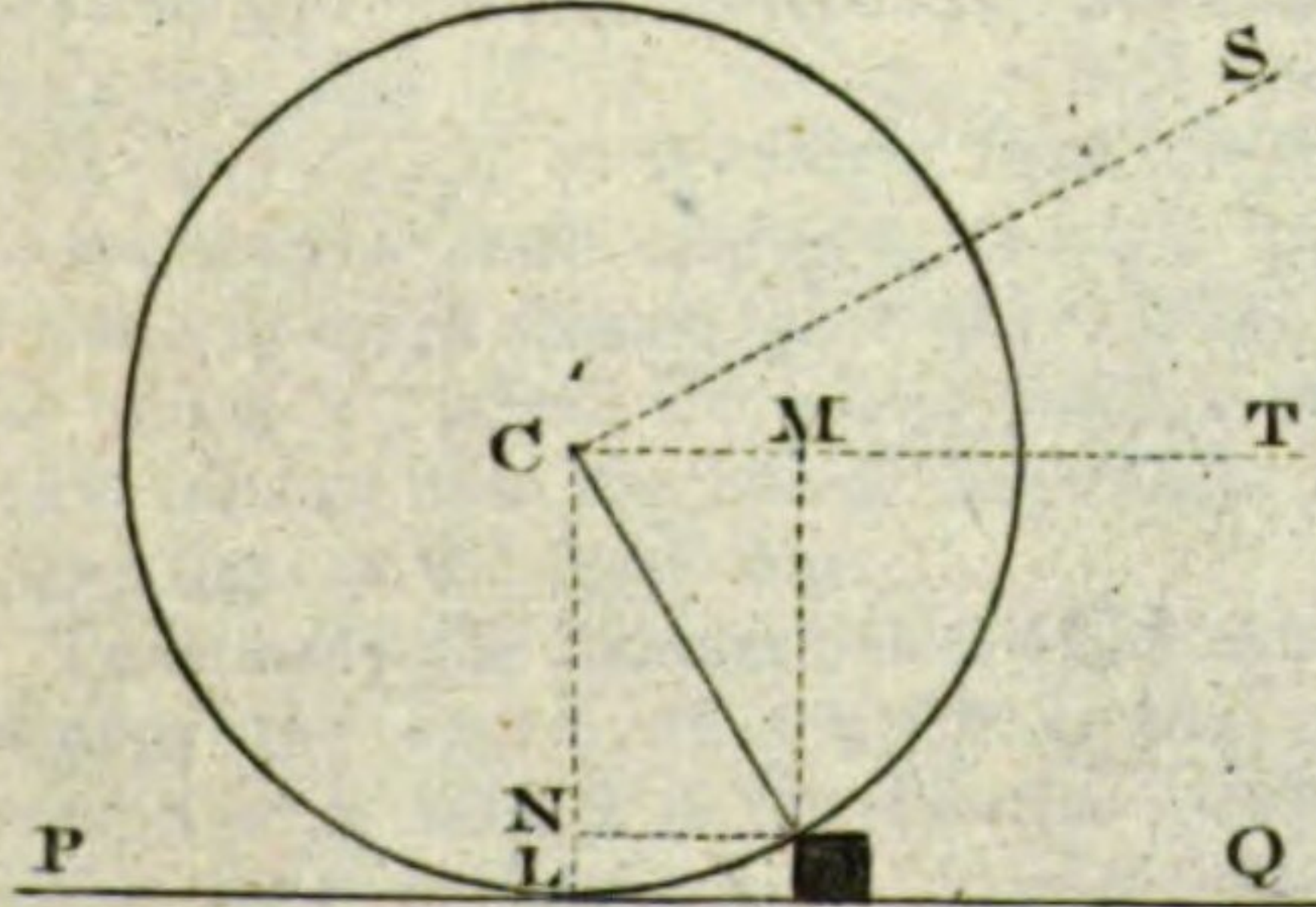


Fig. 80.

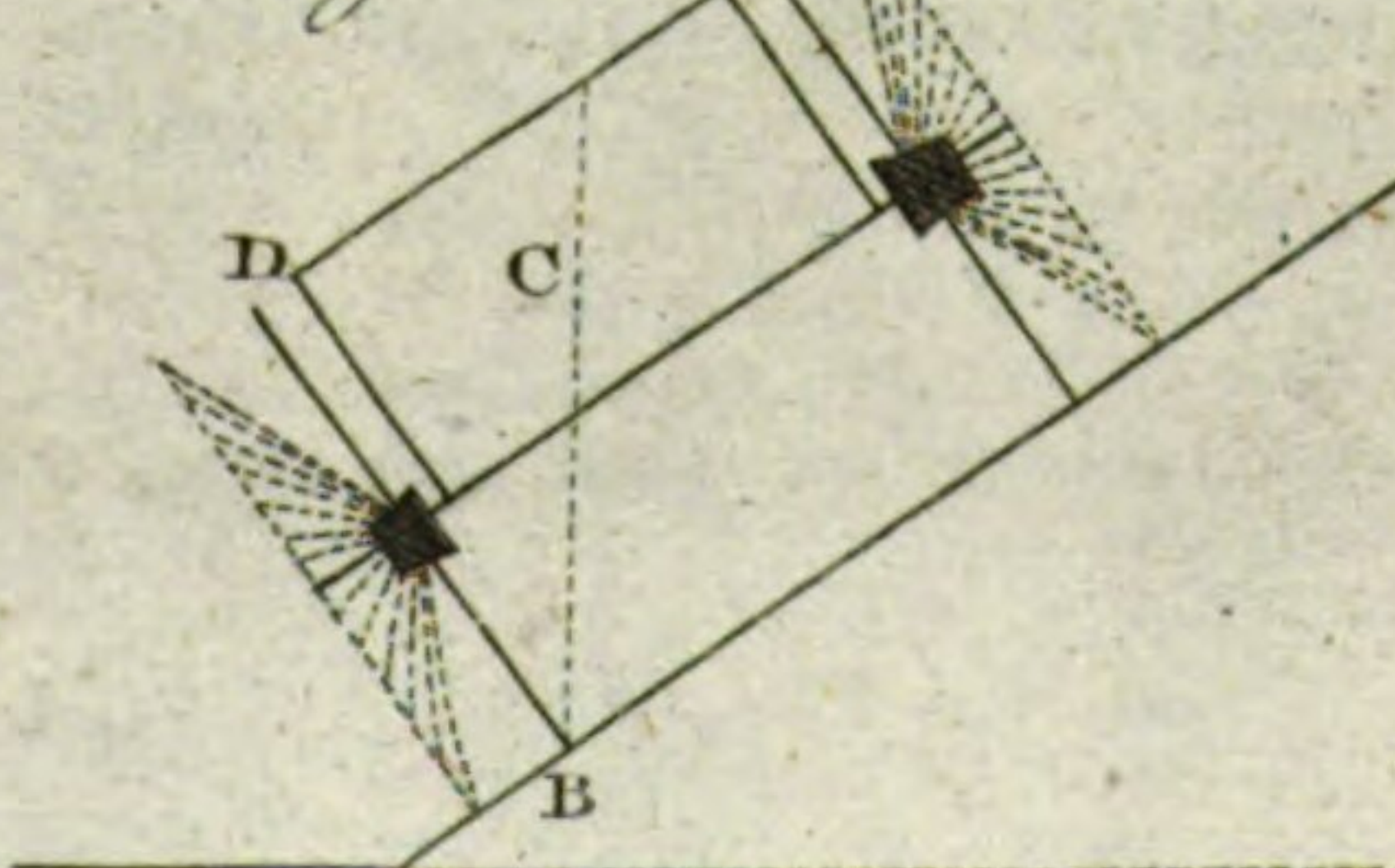


Fig. 81.

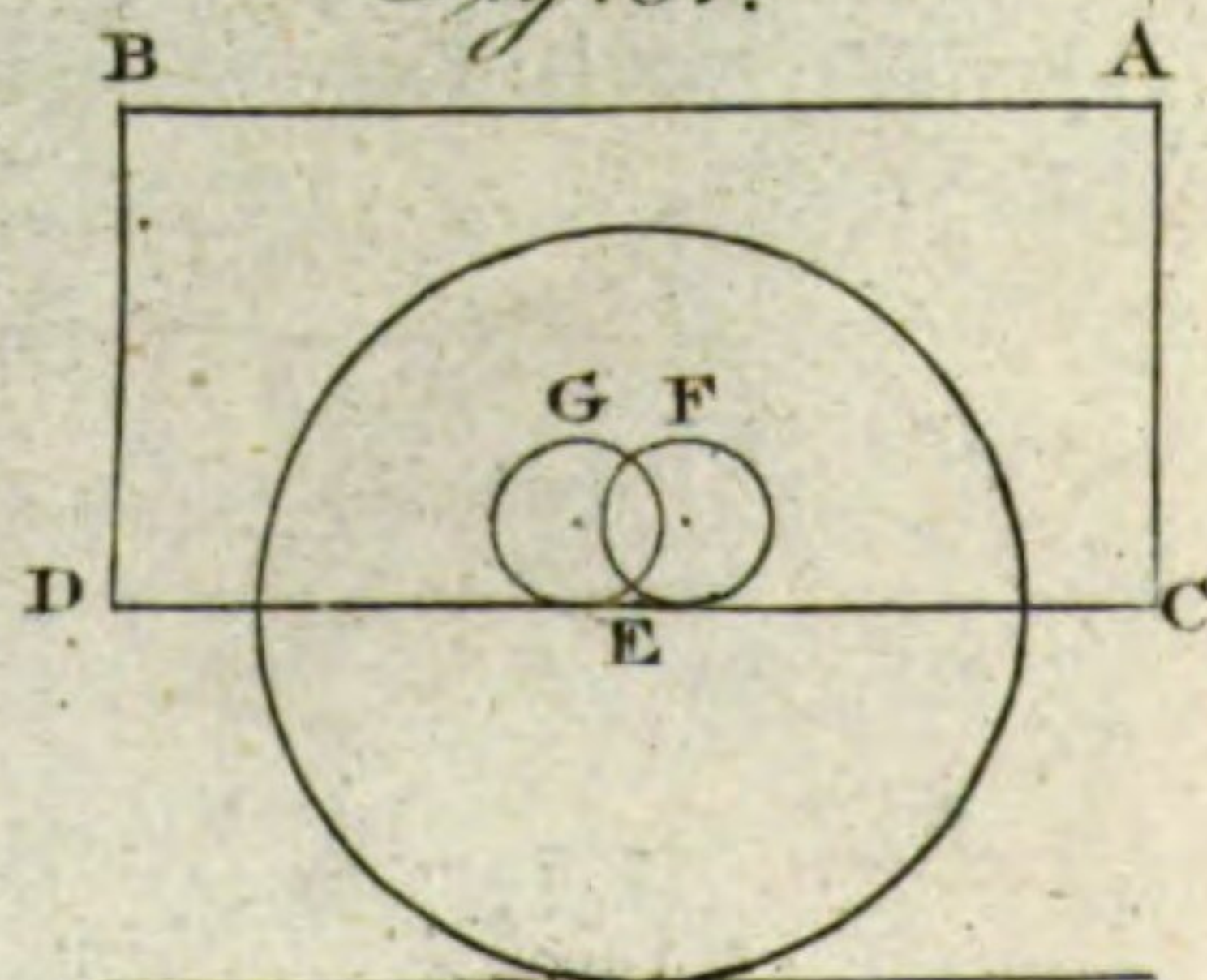
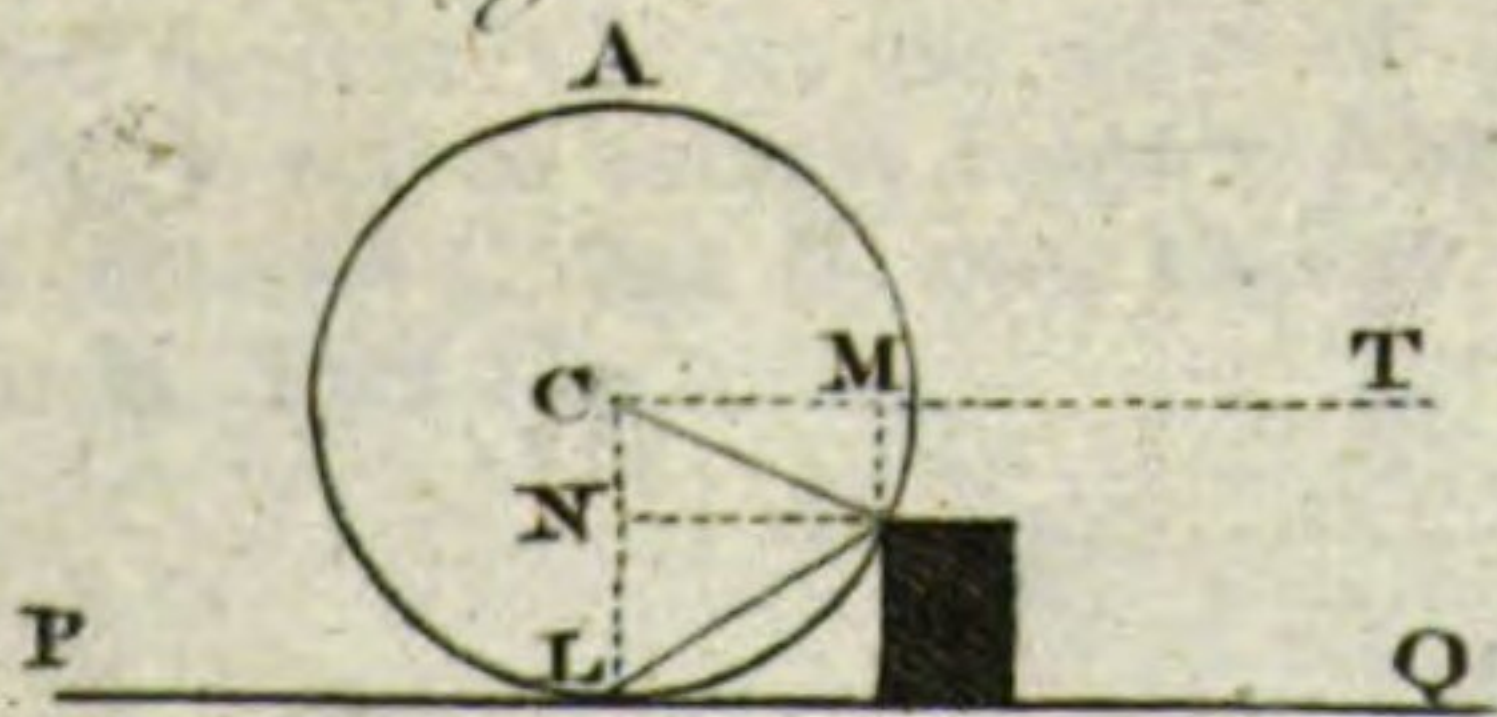
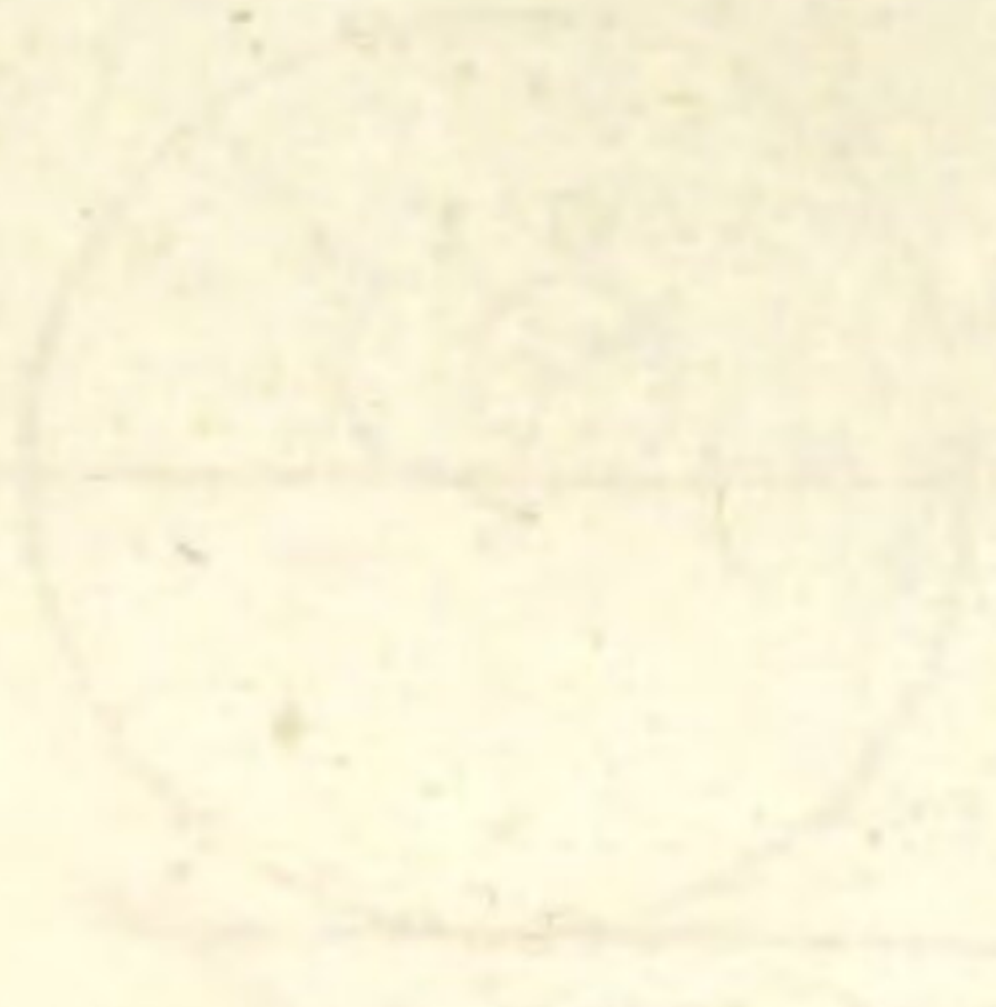
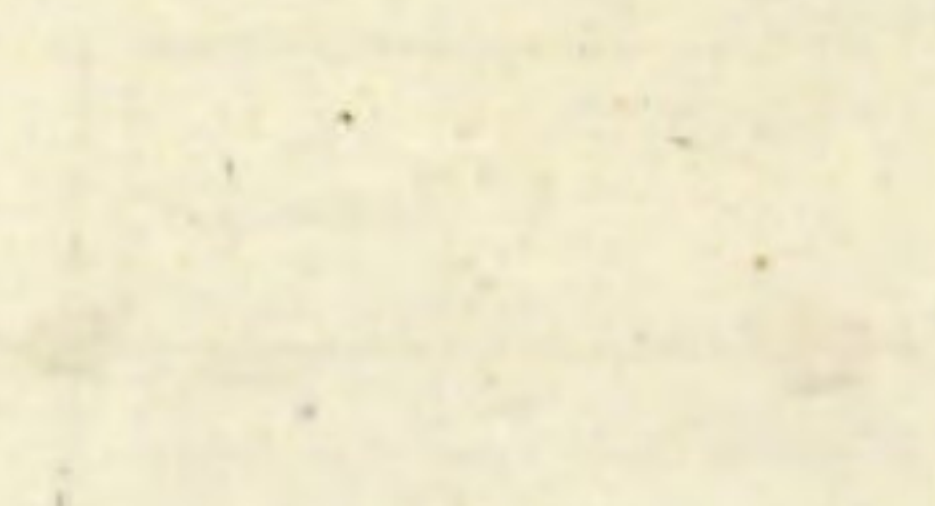


Fig. 74.



1777-1778

1779-1780



Wheel-carriages,

either above or below it, the body can only be kept in equipoise while that line remains directly above or below the point; for if the body is moved forwards, as in two-wheeled carriages moving down hill, a greater part of the weight will be thrown forwards over the line of suspension than what remains behind it; and consequently this superfluous part must be borne by the animal which draws it. In ascending any height, just the reverse takes place; for thus a portion of the weight is thrown backwards, and will tend to lift up the animal altogether. The consequence of this is, not only that the creature must proceed with great pain, but that the friction on the nave and axle will be augmented by laying upon them a part of the animal's weight also. If the body be suspended above the centre of gravity, the effect, though the same in the main, will be reversed in the ascent and descent of hill, as long as the body is firmly attached to the shafts; but should the whole weight be suspended under the axle, independent of the shafts altogether, then it will always, whether ascending, descending, or moving horizontally, have the same effect as if hung directly by it.

45
Of suspending carriages above or below the centre of gravity.

Our author next proceeds to treat of a generally received opinion, that the disadvantages attending carriages suspended either above or below the centre of gravity are augmented by the height of the wheels. The reason given for this opinion is, that the hinder part of the load in ascending an hill, being thrown back, will overhang that part of a large wheel which touches the plane, much more than when a smaller wheel is used. Mr Anstice, however, observes, that all the disadvantage, in either case, is expressed by the weight which, from its action upon the axle, tends to lift the animal, which must always be the same whether the wheels are high or low. Thus, in fig. 76. let a carriage be represented with two wheels of four feet diameter, ascending a plane of 35° elevation from the level LE. Let fig. 77. represent a carriage exactly in the same circumstances with the former, only that the wheels are six feet in diameter. Let C be the centre of gravity, and SP the line of gravity parallel to the central line AR, the line of support or suspension; in each of these the body is thrown so far back by its position, that the space GS and AR is taken from before the line of gravity, and added to the part behind it. Hence a certain part of the animal's weight must be exerted upon the shafts, in order to balance that of the carriage, which is thus thrown back, and which, as is evident from the figures, must be the same in both carriages, though the wheels of the one so much exceed those of the other in size, and the point T, where the wheel touches the plane, is much farther from the line of suspension in the large wheel than in the small one.

To remedy the inconvenience which must arise from placing the centre of gravity in the carriage low enough with respect to the wheels, it will be best to apply three or four wheels, placing them in such a manner that the line of gravity may always fall between the wheels, in whatever situation the carriage may probably be placed. Thus if the body A, fig. 78, be placed on four wheels, the axles of which are at B and C, it will be entirely supported between them, though more by C than B, even though the carriage

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should be ascending an hill as steep as HI, viz. 50 degrees, which cannot ever happen in practice. Even in this case the animal would have no occasion to make exertions for preserving the balance of the carriage, though, had it been supported only by the axles of two wheels at S, far the greater part of the weight of the carriage would have been thrown behind, and the equilibrium could not have been preserved without the greatest difficulty. Hence it is plain, that the greater the distance betwixt the axles of three or four wheels applied to a carriage, the less liable will it be to have the line of gravity thrown out of its proper direction; but as this distance greatly augments the difficulty in turning a carriage, some medium is to be observed in this as well as other things.

What has been just now observed with regard to the preserving the balance of a carriage longitudinally, applies equally to the preventing it from being overturned laterally upon uneven roads, or such as have one side much higher than the other. In order to this, we must take care to keep the line of gravity so far within the body of the carriage that it cannot be thrown out of it by any ordinary declivity of the road upon one side more than another. In the present case, however, as the wheels are not moveable on an axle in a lateral direction, we must consider the points of suspension to be those where the wheels touch the ground. Thus, let fig. 79. represent the cross section of a carriage moving upon two wheels; let C be its centre of gravity: it is plain, that in the position there represented, each of the points A and B sustains an equal share of the weight, and must do so as long as the carriage moves upon level ground: but if it be drawn along a road one side of which is higher than the other, such as is represented fig. 80. then the centre of gravity, and consequently the whole weight of the carriage, will bear upon the point of the wheel B, with this additional inconvenience, that the pressure does not lie perpendicularly but somewhat obliquely, by which the wheel is in great danger of being broken. To avoid inconveniences of this kind, the points of bearing upon the wheels are removed to a greater distance than the exact perpendicular, and this is called *dishing* the wheels; the good effects of which are evident from the figure. The wheels are dished by inserting the spokes into the naves in such a manner that they may decline every way from the carriage. Some disadvantage, however, attends this contrivance, for the carriage thus takes up more room upon the road, which makes it more unmanageable; and when it moves upon plain ground, the spokes not only do not bear perpendicularly, by which means their strength is lessened, but the friction upon the nave and axle is made unequal, and the more so the more that the wheels are dished. To obviate these inconveniences, some have bent downwards the ends of the axles; but thus the good effects of the dish is entirely lost, for the wheels are thereby thrown erect, and the breadth of the dish doubly increased on the upper part of the carriage.

The practice of bending forward the ends of the axle is still worse; for thus the wheels are thrown out of that parallel direction which they should always preserve on the ground, and likewise increases the friction both on the shoulders of the axles, and like-

5 C

wife

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Of preventing a carriage from being overturned.

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wise on the ground; for the wheels, by rolling in this position, would soon come together if not prevented by the shoulders of the axles; whence in every revolution they must rub with considerable force upon the ground.

47
How the power of wheels may be augmented.

The power of wheels can only be augmented in two ways. 1. By increasing the length of that arm of the lever to which the power is applied; and, 2. By diminishing the friction betwixt the nave and axle. The former is only a temporary expedient in case of any obstacle which cannot be surmounted in the ordinary way. It is accomplished, by transferring the action of the animal's power from the centre to the upper part of the circumference of the wheel: thus the power of the lever will be nearly doubled, as is shown from fig. 71. for if the power be applied to the wheel at A, then the arm of the lever would be represented by the dotted line AO instead of CO; and the former being nearly twice as long as the latter, their powers must be in the same proportion. It is evident, however, that this mode of applying the animal's power can only be useful in any sudden emergency; for were we to attempt to reduce it into practice by winding a rope or chain about the circumference of the wheel, the animal must move twice as fast as the carriage. See this also exemplified in Plate CCLXXXV. fig. 58, where the moving power is represented by the weight P; the wheel EF turning between two toothed planes AB and CD. Here it is evident, that while one of the small divisions *ca*, *ac*, &c. moves forward its own length, the plane A must do the same, while the centre, by the motion of which only that of the wheel can be measured, moves but through half the space.

48
Of friction-wheels.

Plate
CCLXXXVII.

2. With respect to friction-wheels or rollers, the case is different; and we may apply these in as great numbers, and in as great a variety of ways as we please, without fear of inconvenience. The best method of applying them, according to Mr Anstice, is to have the wheels and axle fixed to one another, so that both may turn together. Two friction wheels a little overlapping each other, must then be fixed on each side of the body of the carriage, so that it may bear on the axle in the intersection of the wheels, as is represented in fig. 81. Here ABCD represents the body of the carriage, the large circle one of the wheels fixed to the axle E. The circumference of each of the friction-wheels F and G is supposed to be three feet, and that of their axles three inches. As the large wheel then revolves by the motion of the carriage, and thus transfers the friction from its circumference to its axle; so the friction of the axle itself is now transferred from the circumference of the friction-wheels to their axles. Every revolution of the great wheel, therefore, during which it passes over 18 feet of ground by means of the motion of the axle, puts the lesser wheels round one sixth part of their circle; and consequently their axles are moved through the same part of their circumference, the friction being thus reduced to that upon this small part; which being no more than half an inch, becomes 432 times less than it would have been on the large wheel without any motion on an axle, and 12 times less by means of the friction-wheels than without them. The axles on both sides indeed are in motion, but the calculation must be made as if only one moved; for the greater number of wheels

there are, the more will the friction be divided among them.

An objection of considerable weight arises to this method of fixing the wheels and axles together, that thus the wheels are prevented from moving with different velocities as they ought to do, when the carriage moves out of a right line; but this may be obviated by leaving the friction wheels loose upon their axles, by which means they will be at liberty to move with different velocities, at the same time that they will have the advantages of friction-wheels always as to one wheel of the carriage, and generally as to both.—The whole contrivance, however, seems likely to be entirely superseded by the following one of Mr Gamett of Bristol, who has obtained a patent for it. The general principle on which he proceeds is this. Between the axle and nave a hollow space is left to be filled up by solid equal rollers nearly touching each other. These are furnished with axles inserted into a circular ring at each end, by which their relative distances are preserved; and they are kept parallel by means of wires fastened to the rings between the rollers, and which are rivetted to them.

To understand the effect of this machinery we must consider, that if, when plane surfaces move with a roller between them, if the under one be fixed, the upper plane will put the rollers forward but with half the quantity of its own motion. This is owing to the reaction of the stationary plane, which causes the roller to move backward upon itself as much as the other causes it to move forward upon itself. Thus, let CD, fig. 82. be a fixed surface, and AB a moveable one, with a roller E between them; if B be moved forward to G, it will cause the roller to move to F, which is but half the distance that AB has moved; because it has rolled in a retrograde direction as far against the surface BA as it has gone forward upon the other. This is entirely owing to the resistance it meets with from CD; for if it did not touch that surface, but was attached by any other means to AB, it would be carried along with it through the whole space without any rolling motion. Hence it is clear, that if a roller be placed between the axle and nave of a wheel, and the latter be turned round, the roller will move with a retrograde motion upon the axle; and in order to carry it quite round, the nave must be turned as much beyond a whole revolution as is equal on its inner circumference to the whole circumference of the axle. To exemplify this, let ABCD, fig. 83. represent the nave of the wheel E, the inner circumference of which is 18 inches, and the axle so small that it may be considered as a point. Let F and G be two rollers closely fitted between them: if then the wheel be turned round, the rollers will also be carried along with it round the point which we consider as an axle; for there can neither be rolling nor friction against a mere point. But if the axle be of any sensible size, for instance one inch circumference, then must each roller move round by the motion of the nave against it, and the resistance of the angle on the opposite side. But in order to do this, it must roll in a retrograde direction upon the nave, and consequently the latter must go as far beyond a revolution as is equal to the circumference of the axle upon it, before the roller can go once round the axle, which in this case is by

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Mr Gamett's method of destroying friction.

Plate
CCLXXXVIII.

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one 18th part of the circumference. Should the circumference of the axle be nine inches, and that of the inner part of the nave remain as before, the wheel must perform one revolution and an half before the roller could be moved once round, and so on in the same proportion: but as the circumference of an axle must always be less than the inner part of a nave turning upon it with rollers between them, it never can amount to two revolutions of the wheel round the axle, however nearly it may approach to it; for no segment of a circle can ever be a straight line.

It will now be apparent, that if several rollers be placed all round between the nave and axle, whichever way the wheel be turned there cannot be any real friction, but merely a rolling of the rollers. If likewise these rollers be all of one size, and very nicely fitted to the cavity, they will keep their places without shifting, and very effectually answer the purpose of destroying friction. As such rollers, however, were very liable to be displaced by accident, the use of them was neglected, till Mr Gamett suggested the improvement already mentioned, and which is represented in fig. 84. Here ABCD represents a piece of metal to be inserted into the nave of a wheel, of which E is the axle, and 1, 1, 1, &c. rollers of metal having axes inserted into the brazen circle which passes thro' their centres; and both circles being rivetted together by means of bolts passing between the rollers from one side of the nave to the other; and thus they are always kept separate and parallel. By this method, indeed, some friction unavoidably takes place betwixt the axles of the rollers and their sockets in the brass-rings; but as the quantity of friction depends principally on the force by which the rubbing surfaces are pressed upon each other, and as in this case there is but the slight pressure occasioned by those accidental circumstances which would bring the rollers together, the friction must be too trifling to be noticed.

Thus far with regard to wheel-carriages in general. We must now make some remarks on the methods of drawing them, and the construction of particular carriages.—Men, by reason of their upright form, are by no means fitted for horizontal draughts; but animals who go upon all fours are remarkably so. In Britain horses are commonly made use of; but mules, oxen, sheep, and dogs, in other parts of the world. In all animals, however, the capacity for drawing a load depends upon their weight as well as their absolute strength. Thus it may happen, that a very heavy horse will draw a load, which a lighter though stronger one could not move; and this will always happen, when the weaker horse exceeds the other in weight more than he is exceeded by him in strength. It is well known that the weight, as far as it goes, reacts upon the horse, and pulls him back as much as he pulls it forward, until the exertions of the muscles of the animal resisted, by the solid ground, overcome the resistance of the load upon the moveable wheels, and it goes forward in proportion to the excess of the one power over the other. If the horse were put upon a moveable plane, and attempted to draw a load upon the solid ground, instead of pulling it forward he would pull himself back.—The horse has two sources of power in drawing a load, viz. his strength and

weight. The former is the source of velocity; and as we find the actual power of any inanimate body in motion by multiplying the velocity into its quantity of matter, so do we find the power of a horse to draw a load, by considering his weight as well as absolute strength. There are even many instances in common practice, where it is useful to increase the weight of an horse or other animal; and therefore when horses are employed to draw mills, it is usual to put a small load upon their backs in order to increase their absolute momentum. Where the animals are equal in strength and momentum, however, the only difference that can take place in the weights they draw must arise from the convenience or inconvenience of the carriages to which they are yoked, or of the roads upon which they walk. A load breast-high is much more easily drawn than one which is dragged along the ground, because the power of the animal is then exerted directly against it; and this holds good whether the horses go up or down hill. In descending, indeed, as the load is then higher with regard to the horse than when it is on a plane, he will consequently pull it with the greater force; but in this case, its own gravity conspires with the draught, and will likewise help the load to descend; so that in this case the animal has an opportunity of exerting his greatest power when there is the least necessity, nay, when it is often inconvenient.

In all carriages with four wheels the two fore ones are made of a much smaller size than the hind ones, both for the sake of turning more easily, and likewise that there may be no danger of cutting the braces; but were both the fore and hind wheels to be of the same height, the carriage would be drawn with much greater ease. It is imagined indeed by the drivers of carriages, that the high hind wheels push on the fore-wheels: but this is evidently absurd; for the fore-wheels must turn as many times round oftener than the large ones as the latter exceed them in size. Thus, if we suppose the circumference of the large wheels to be 18 feet, and that of the small ones only six, it is evident that the latter must turn round three times for once that the large ones turn round. Supposing the carriage therefore to be loaded equally on both axles, it is plain that by the greater friction upon the fore-axle than the other, it must wear out much sooner, and that as much as the fore-wheels are smaller than the hind ones. But it is the universal practice of those conversant in loading and driving carriages, to put a much greater load upon the fore than the back axle. Thus the friction not only becomes greatest where it ought to be least, but the small wheels must necessarily sink deeper into the ground than the large ones, which they are at any rate inclined to do from their size. The only danger in laying the greatest load upon the hind axle is, when the carriage goes up a very steep ascent; but in the few cases in which this may happen, a small temporary weight laid upon the pole betwixt the horses would prevent all danger of oversetting.

To confirm these reasonings by experiment, let a small model of a waggon be made, with its fore-wheels $2\frac{1}{2}$ inches in diameter, and its hind-wheels $4\frac{1}{2}$; the whole model weighing about 20 ounces. Let this little carriage be loaded any how with weights, and have a

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small cord tied to each of its ends, equally high from the ground it rests upon; and let it be drawn along a horizontal board, first by a weight in a scale hung to the cord at the fore-part; the cord going over a pulley at the end of the board to facilitate the draught, and the weight just sufficient to draw it along. Then turn the carriage, and hang the scale and weight to the hind-cord, and it will be found to move along with the same velocity as at first: which shows that the power required to draw the carriage is all the same, whether the great or small wheels are foremost; and therefore the great wheels do not help in the least to push on the small wheels in the road.

Hang the scale to the fore-cord, and place the fore-wheels (which are the small ones) in two holes, cut three eight parts of an inch deep in the board; then put a weight of 32 ounces into the carriage over the fore-axle, and an equal weight over the hind-one: this done, put 44 ounces into the scale, which will be just sufficient to draw out the fore-wheels: but if this weight be taken out of the scale, and one of 16 ounces put into its place, if the hind-wheels are placed in the holes, the 16 ounce weight will draw them out; which is little more than a third part of what was necessary to draw out the fore-wheels. This shows, that the larger the wheels are, the less power will draw the carriage, especially on rough ground.

Put 64 ounces over the axle of the hind-wheels, and 32 over the axle of the fore-ones, in the carriage; and place the fore-wheels in the holes: then put 38 ounces into the scale, which will just draw out the fore-wheels; and when the hind-ones come to the hole, they will find but very little resistance, because they sink but a little way into it.

But shift the weights in the carriage, by putting the 32 ounces upon the hind-axle, and the 64 ounces upon the fore-one; and place the fore-wheels in the holes: then, if 76 ounces be put into the scale, it will be found no more than sufficient to draw out these wheels; which is double the power required to draw them out when the lighter part of the load was put upon them; which is a plain demonstration of the absurdity of putting the heaviest part of the load in the fore-part of the waggon.

Every one knows what an outcry was made by the generality, if not the whole body, of the carriers, against the broad-wheel act; and how hard it was to persuade them to comply with it, even though the government allowed them to draw with more horses, and carry greater loads than usual. Their principal objection was, that as a broad wheel must touch the ground in a great many more points than a narrow wheel, the friction must of course be just so much the greater; and consequently there must be so many more horses than usual to draw the waggon. It is believed that the majority of people were of the same opinion; not considering, that if the whole weight of the waggon and load in it bears upon a great many points, each sustains a proportionably less degree of weight and friction, than when it bears only upon a few points: so that what is wanting in one is made up in the other; and therefore will be just equal under equal degrees of weight, as may be shown by the following plain and easy experiment.

Let one end of a piece of pack-thread be fastened

to a brick, and the other end to a common scale for holding weights: then, having laid the brick edgewise on a table, and let the scale hang under the edge of the table, put as much weight into the scale as will just draw the brick along the table. Then taking back the brick to its former place, lay it flat on the table, and leave it to be acted upon by the same weight in the scale as before, which will draw it along with the same ease as when it lay upon its edge. In the former case, the brick may be considered as a narrow wheel on the ground; and in the latter, as a broad wheel. And since the brick is drawn along with equal ease, whether its broad side or narrow edge touches the table, it shows that a broad wheel might be drawn along the ground with the same ease as a narrow one (supposing them equally heavy), even though they should drag, and not roll, as they go along.

As narrow wheels are constantly sinking into the road, they not only prove very destructive to the highways over which the carriages move, but by reason of this very sinking, they must be accounted as going continually up hill in some degree, even when drawn upon plain ground. These inconveniences are obviated by the use of broad wheels; and indeed the utility of these is so obvious, that it seems surprising how the use of narrow wheels is on any occasion permitted by the legislature. The wheels ordinarily used for waggons are nine inches broad; but of late a practice has been introduced of using rollers 16 inches broad; by which the inconveniences of the narrow wheels are removed, and the greatest weights may be drawn over the very worst roads, not only without making them worse, but greatly to their improvement. It has been objected, that broad wheels soon accumulate in clayey roads so much matter that it would soon equal an ordinary load; but, not to mention that such roads ought to have no existence in a country where such sums are annually paid for their reparation, it is evident, that passing heavy rollers over them is the only method to give that firmness to clay which is necessary for its supporting the animals who walk over it; and indeed many of the roads in this country, by reason of the continual poaching by wheels and feet of horses, &c. become throughout a great part of the year almost impassable by people on foot. The legislature appear to be very sensible of the advantages derived from these rollers, and accordingly allow such carriages as are furnished with them to go toll-free.

In the transactions of the Royal Irish Academy for 1788, we meet with some curious observations on the subject of wheel-carriages, by Mr Lovell Edgeworth. This gentleman informs us, that he was present in London in 1773, at a set of experiments tried in order to determine the comparative advantages of low and high wheels. The apparatus for these experiments was constructed with the greatest accuracy. The carriages themselves were made by the best workmen in London, and they were drawn along a smooth table by silk strings of small diameters put over a pulley nicely constructed, and fitted up in such a manner as to have scarce any friction. On applying a weight to the end of the string which passed over the pulley, little difference appeared in the velocities with which the carriages passed along the table, whether the wheels were high or low; but what appeared surprising was, that when obstacles were put in

Wheel-carriages.

50
Of broad and narrow wheels,51
Mr Edgeworth's experiments on carriages.

Fig. 86.

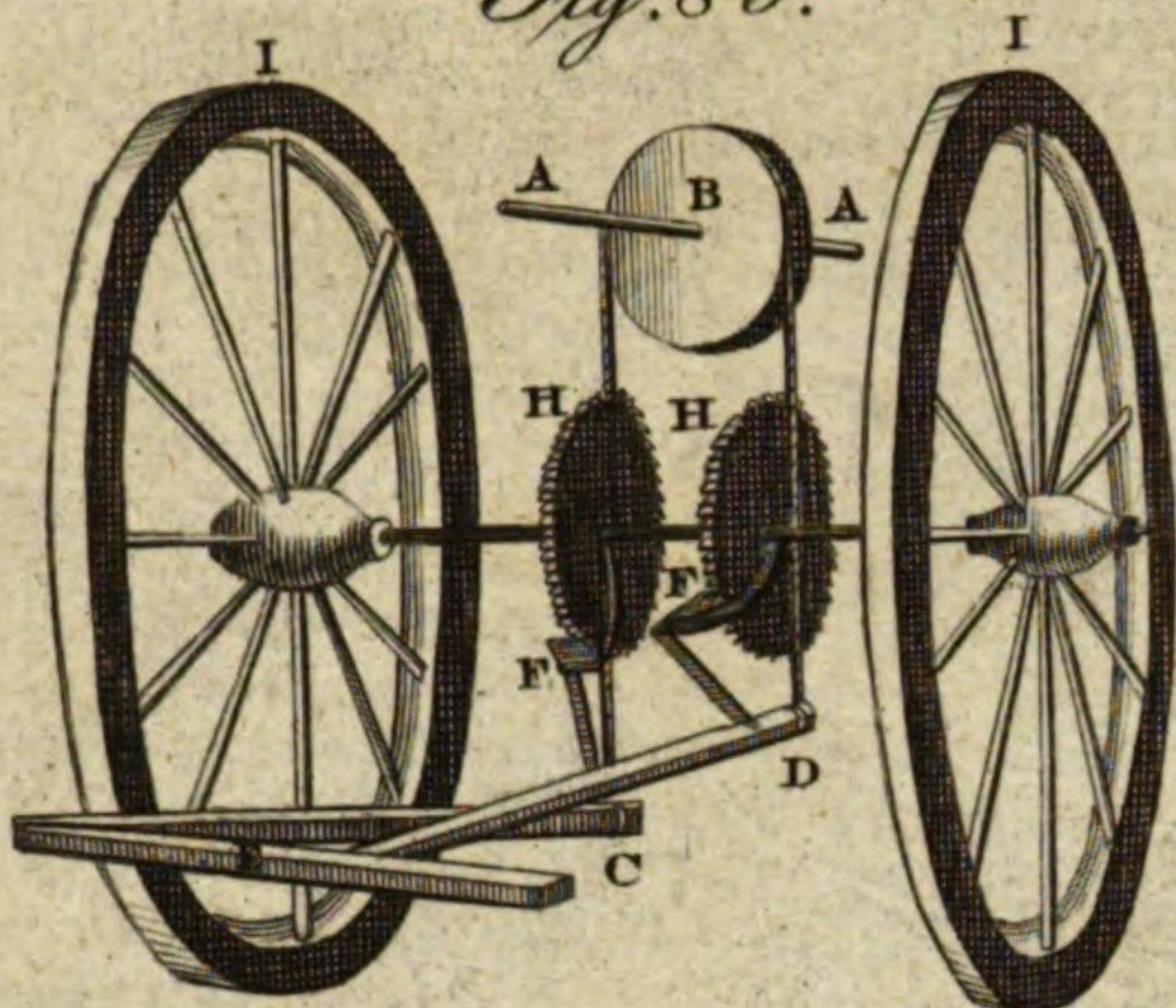


Fig. 82.

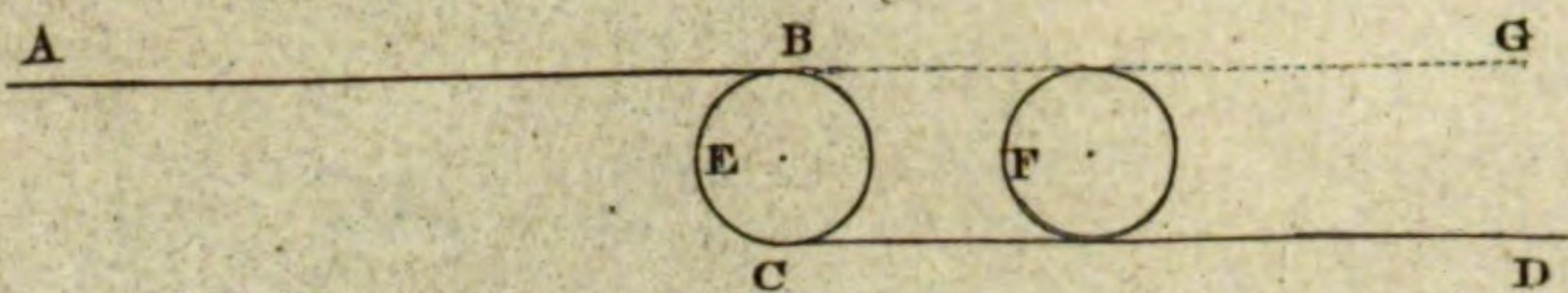


Fig. 85.

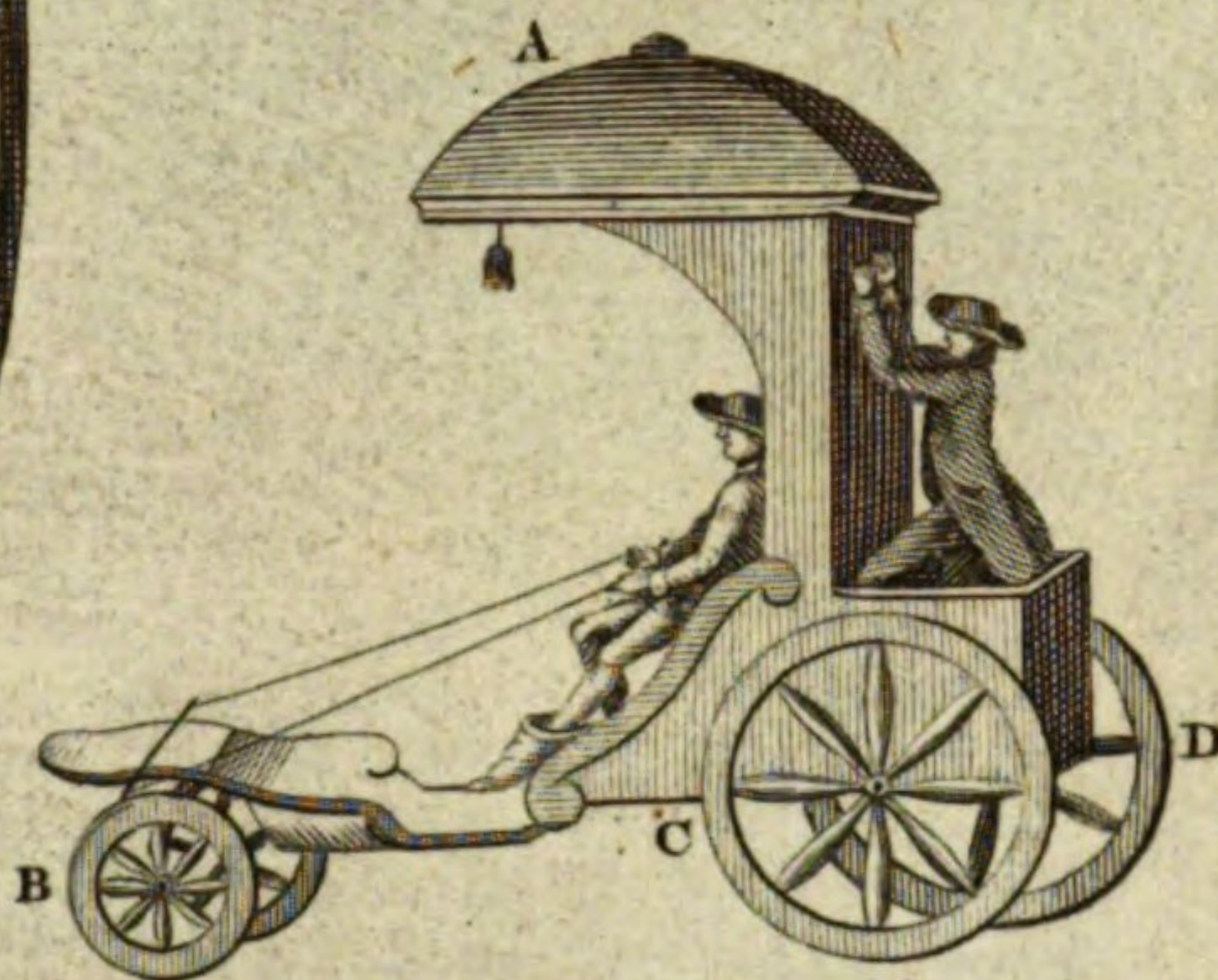


Fig. 83.

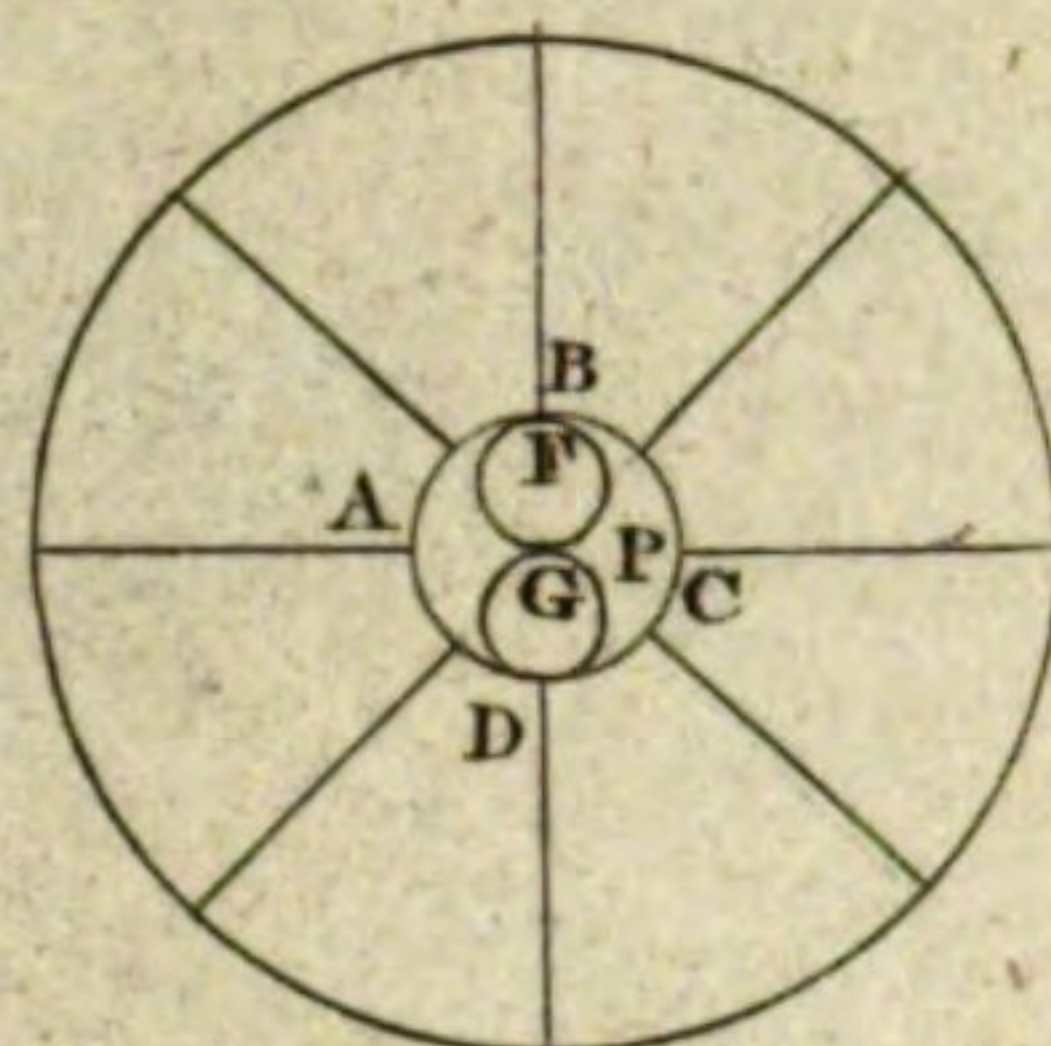


Fig. 87.

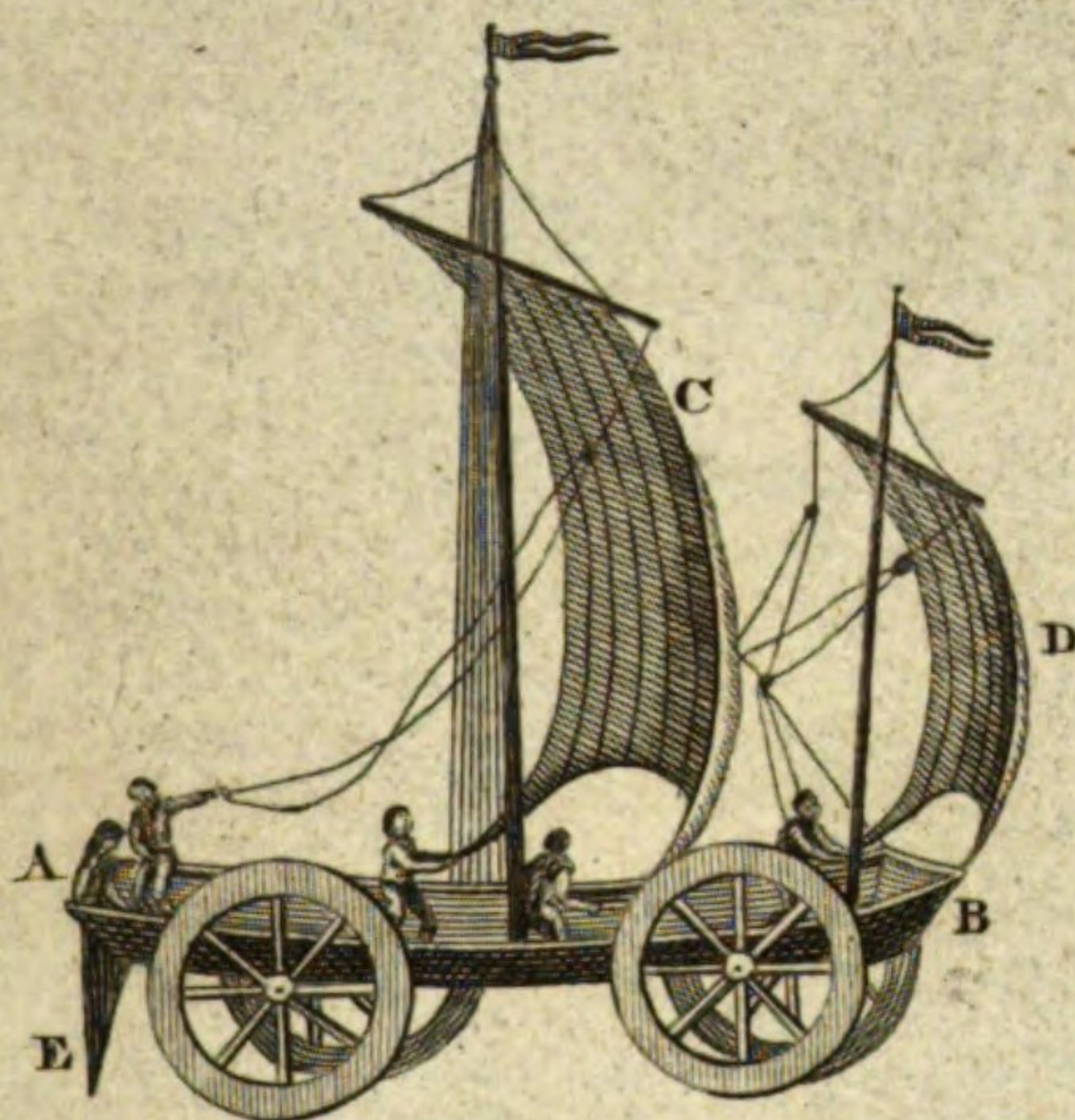


Fig. 88.

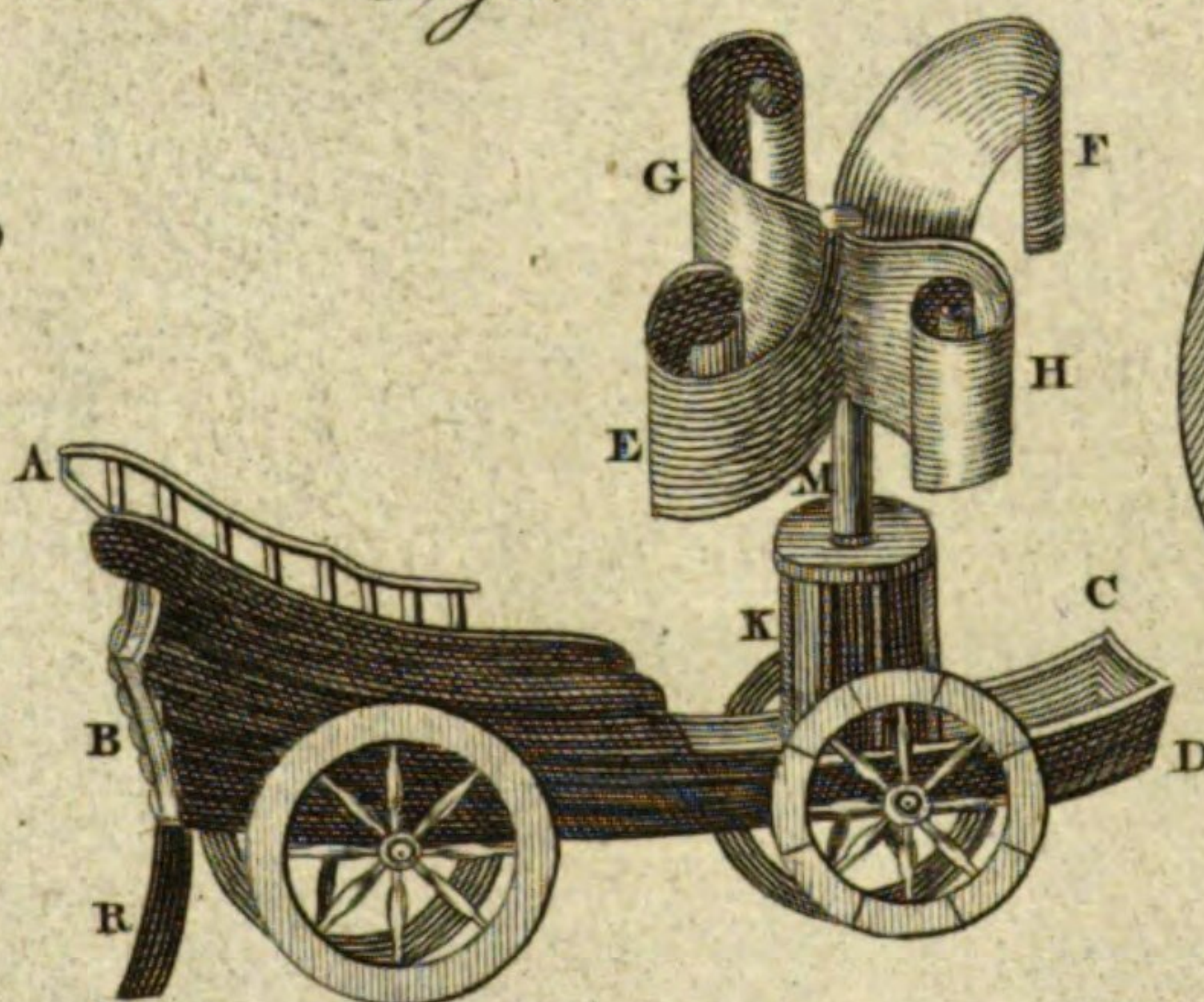


Fig. 84.

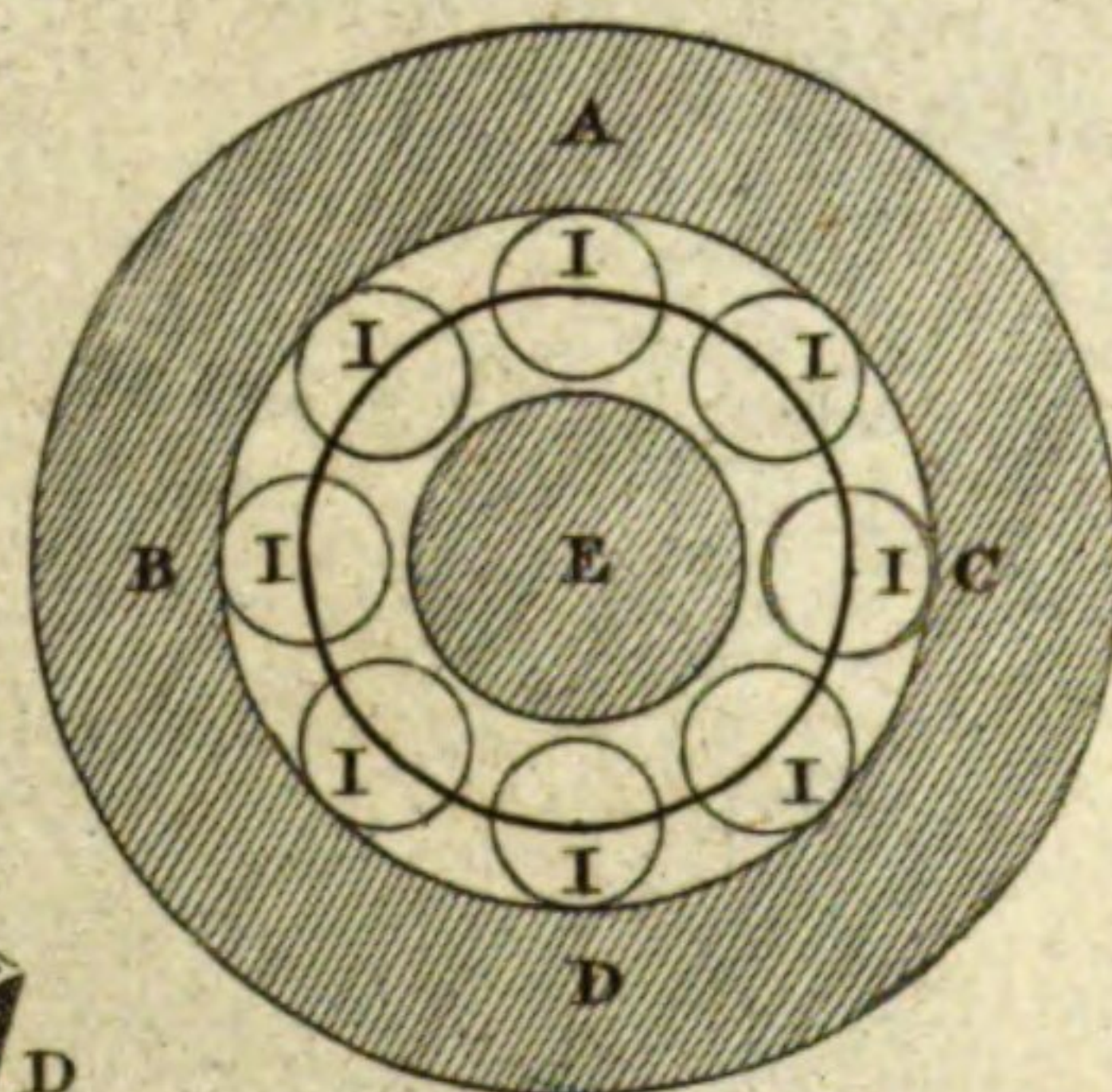


Fig. 90.

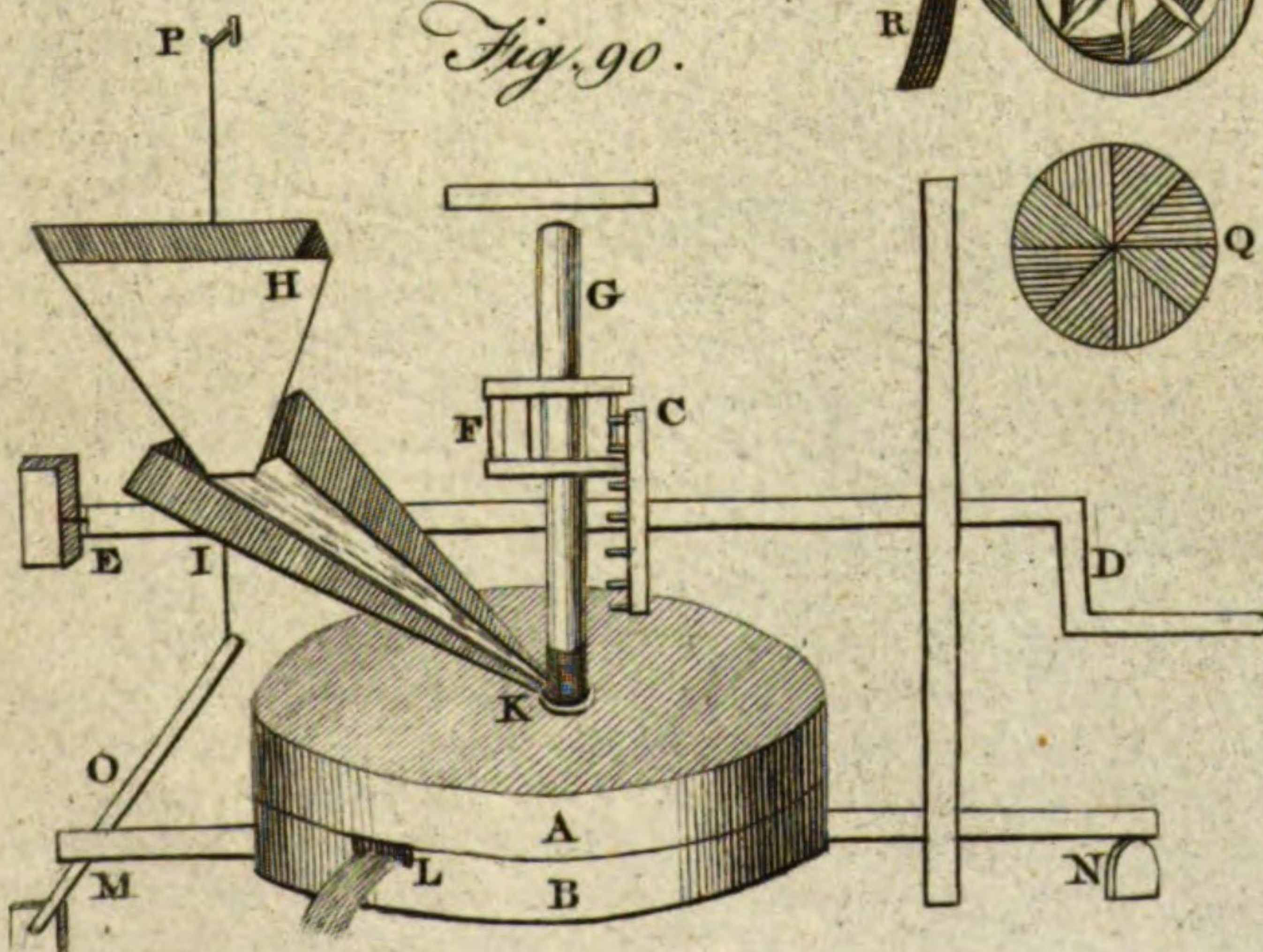
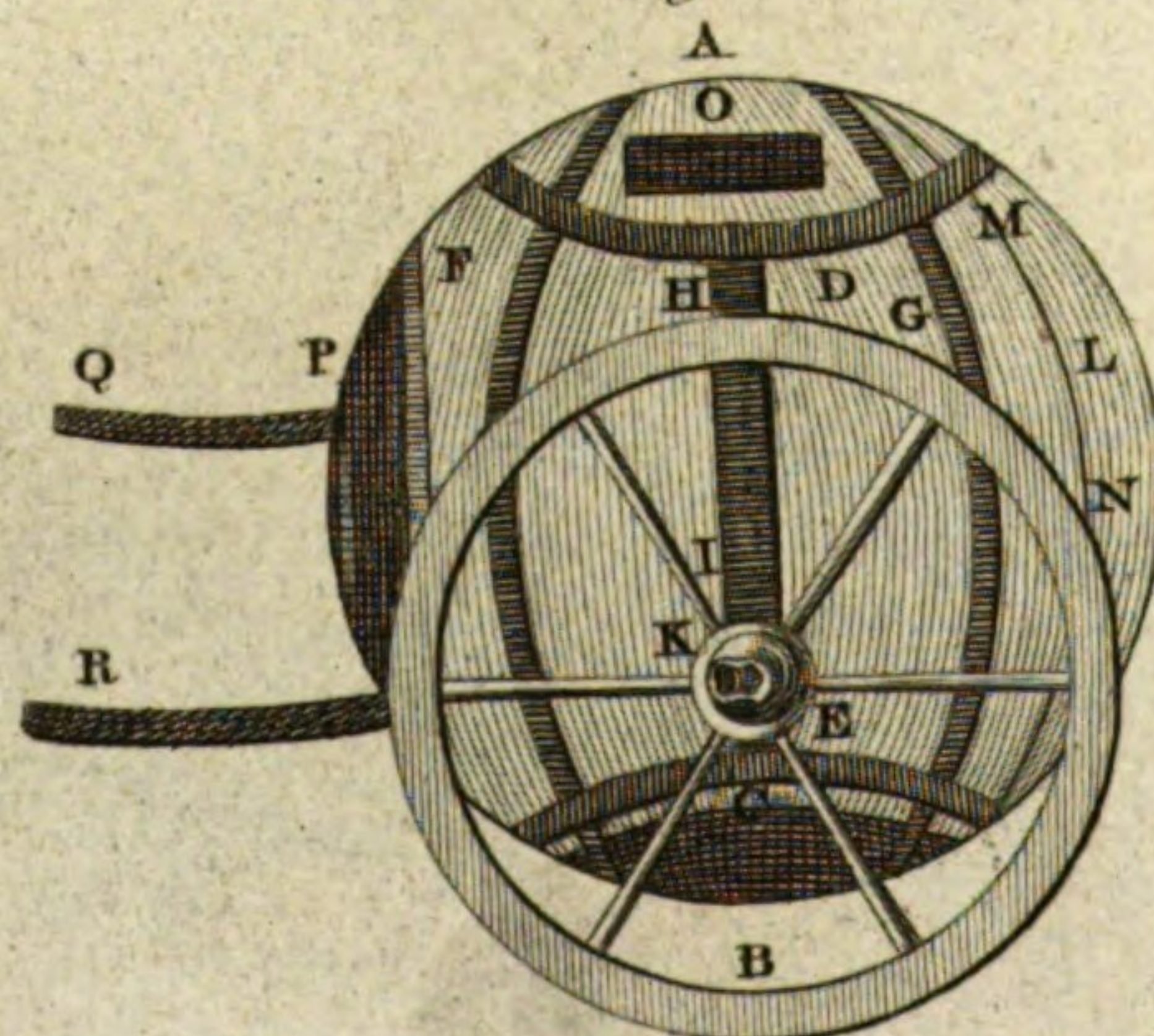


Fig. 89.



A Bell Prin. Water Sulptor, front.

Wheel-carriages.

Wheel-carriages.

in their way, sometimes the high and sometimes the low wheels had the advantage, according to the different shapes and sizes of the obstacles. "It appears at first view (says Mr Lovell), that the force which drew these carriages was employed only in overcoming the friction of the axle-tree, or in lifting the weight over the obstacle. But I suspected at the time, and have since been convinced, that an obstruction of another sort existed more considerable than either of these which I have mentioned, and which has not to my knowledge been taken notice of by any writer upon mechanics."

52
Supposed
proof of the
vis inertia,
independ-
ent of gra-
vity.

This obstruction is no other than the *vis inertia* of matter, which has so much engaged the attention of philosophers, and the non-entity of which, in distinction from the power of gravity, seems now to be pretty generally admitted. The argument used for its existence by Mr Edgeworth is as follows: "After a carriage has been once set in motion upon a smooth road with any given velocity, its motion, so long as that velocity is continued, is neither retarded nor promoted by the *vis inertia*; but whenever it passes over any height, not only the weight of the carriage must be lifted up, but the *vis inertia* of that weight must be overcome in a new direction; and as much velocity must be communicated to it in that new direction as will enable it to rise to the height of the obstacle while it passes over its base. When an obstacle is of such a size and shape that a wheel of six feet diameter must strike the top of it at once, and not roll from the bottom upwards, and when its shape will permit a smaller wheel to touch it during its whole ascent, as there is more time allowed for overcoming the *vis inertia* of its weight in the latter case than in the former, the smaller wheel may be drawn forward by a less power than the larger, notwithstanding the advantage of a lever, which is in favour of the larger wheel."

To determine this, our author made use of an inclined plane five or six feet long and one foot high, placed on a smooth horizontal floor. He then assumed the distance to which the carriage was driven on the floor by the velocity acquired in descending the plane, as a measure of the force with which it could overcome any obstacle placed in its way; and consequently the diminution of the distance was the measure of the resistance itself. Not satisfied with this apparatus, however, he screwed a circle of iron three feet three inches in diameter upon a solid floor. In the centre of this circle he erected an upright axis or roller upon two pivots, one resting in a socket of brass upon the floor, the other in a bridge raised across the machine. Around the axis was wound a small silk cord, with a scale and weights fastened to it, which passed over a pulley into an adjoining stair-case, and turned the axis with a determined velocity. An horizontal arm of wood extended from the axis to the circumference of the inner circle, and to the extremity of the arm was fastened a piece of steel in form of the axle-tree of a carriage, having a wheel upon it, which by the motion of the axis was carried round upon its edge like the stone of a tanner's mill. The arm was furnished with an hinge, by means of which the wheel could rise up and pass over any obstacle which stood in its way. Above this was another arm, having on its extremity

a tin vane, which by its resistance to the air regulated the motion of the machine. On putting weights into the scale, it was found that eight or ten turns were necessary to give the wheel an uniform velocity, which was preserved in all the experiments, any resistance thrown in the way being overcome by an addition of weight, and consequently this addition being always an accurate measure of the resistance.

On loading the wheel so as to weigh about four pounds, it acquired a velocity of ten feet in a second by nearly five pounds and an half; but on placing in its way an obstacle only a quarter of an inch high, six pounds and an half were required to cause the wheel pass over it. Two such obstacles required fourteen and an half pounds; but on substituting two obstacles of the same height, but making an inclined plane three quarters of an inch long, it required only two pounds to overcome their resistance. "The difference therefore (says he) between two and fourteen, must be attributed to the *vis inertia*; for the velocities of the carriage and the heights of the obstacles remaining the same, the only difference that exists is, that in the one case the wheel has much more time to surmount the obstacle than in the other, and consequently had much less *vis inertia*."

On this piece of reasoning, however, it is impossible to avoid making the following remark, *viz.* that nothing happens but what ought to do so upon the common principles of mechanics. One obstacle, when upright, required six pounds and an half to overcome it; but when an inclined plane three times the length was added to it, it ought then to have been overcome by a third part of the power, that is, by something more than two pounds; and the reason why something less than the third part was required, seems to have been the advantage the wheel had by acting as a lever; as has been already observed on the principles of Mr Anstice. There is not therefore the least occasion to apply to a *vis inertia*, or any obscure principle, for a solution of what may so easily be solved upon the common principles of mechanics and gravity.

Mr Edgeworth concludes his observations with some remarks on the use of springs, which are found greatly to facilitate the draught of carriages. "Whatever (says he) permits the load to rise gradually over an obstacle without obstructing the velocity of the carriage, will tend to facilitate its draught; and the application of springs has this effect to a very considerable degree: the same weight of four pounds being drawn over the same obstacles, when springs were put between the load and the carriage, by four pounds instead of 14. This remarkable difference points out the great advantage of springs in rough roads; an advantage which might be obtained for heavy waggons, as well as for other carriages, by a judicious application of the same means.

53
Use of
springs in
carriages.

"It appears from the Memoirs of the French academy, that the idea of applying springs to carriages had occurred to M. Thomas in the year 1703; who has given a drawing of a carriage constructed upon this principle many years before it was attempted to be put in execution. So little expectation had he of success, that he expressly mentions it as a theory which could not be reduced to practice: he had, however, no notion of applying springs to facilitate the draught,

but

Wheel-carriages.

but merely for the convenience of the rider; and I apprehend that it is not at present commonly imagined that springs are advantageous for this purpose; nor would it at first sight appear credible, that, upon a rough paved road, such as are common in Cheshire and other parts of England, a pair of horses could draw a carriage mounted upon springs with greater ease and expedition than four could draw the same carriage if the springs and braces were removed, and the carriage bolted fast down to the perch."

54
On high and low carriages.

Mr Lovell made also some experiments with high and low, long and short, carriages, in order to determine which was the most advantageous, but could not recollect the particular results of each experiment. He was, however, assured, that the preference lately given in England to high carriages is ill-founded; and that, though in smooth roads, the height of the carriage is a matter of indifference, yet in rough roads it is very disadvantageous. The length of carriages also, if their weight be not increased, is a matter of indifference, except in very uneven roads, and where there are deep ruts; long carriages being preferable in the former case, and short ones in the latter.

The reason why springs so much facilitate the draught of carriages seems to be, not only that they allow the wheels to pass more gradually over the obstacles, as Mr Edgeworth says, but that by their elasticity they make the carriage bound upwards every moment for a small way. Thus its gravity is for that moment in a great measure counteracted, and the progressive motion which it has already acquired is at liberty to act more freely in pushing it forward; for were it possible very suddenly to take away the horses from a carriage mounted on springs, and moving with considerable velocity, it would continue for sometime to move of itself; the weight in this case acting as a fly upon any mechanical engine, by means of which the machine accumulates a certain quantity of power, and will keep itself in motion for a considerable time after the hand is taken away from it. The weight of all carriages indeed has some effect of this kind, otherwise the draught would require an intolerable exertion of strength; and it is to be observed, that this tendency to proceed in the direction in which it is once set a-going, is remarkable in all great quantities of matter, and very perceptible even when weights are pulled directly upward; for in raising great weights by a crane, the burden is lifted with considerably more ease when near the top than at bottom, even after making every necessary allowance for the weight of the rope, &c.

55
A carriage to go without any other force than what it receives from the passengers. Fig. 85.

By means of wheels, some people have contrived carriages to go without horses, or any other moving power than what was given by the passengers, by the wind, &c. One of these is represented by ABCD. It is moved by the footman behind it; and the forewheels, which act as a rudder, are guided by the person who sits in the carriage (A).

Between the hind-wheels is placed a box, in which is concealed the machinery that moves the carriage. AA (fig. 86.) is a small axis fixed into the box. B is a pulley, over which runs a rope, whose two ends are

fastened to the ends of the two levers or treddles CD, whose other ends are fixed in such manner in the piece E, which is joined to the box, that they can easily move up and down. F, F, are two flat pieces of iron that are joined to the treddles, and take the teeth of the two wheels H, H, which are fixed on the same axis with the hind-wheels of the carriage, I, I.

Wheel-carriages.

It is evident, that when the footman behind presses down one of the treddles, suppose C, with his foot, he must bring down one of the pieces of iron F, and consequently turn the wheel H that is next to it; and at the same time, by means of the rope that goes over the pulley, he must raise the other treddle D, together with its piece F, which being thrust down will turn the other wheel H; and so alternately: and as the great wheels are fixed on the same axis, they must necessarily move at the same time.

It is easy to conceive, that if the ends of the treddles next E, instead of being placed behind the carriage, were turned the opposite way, so as to come under the feet of the person who sits in it, he might move it with equal, or even greater facility, than the footman, as it would then be charged with the weight of one person only.

A machine of this kind will afford a salutary recreation in a garden or park, or on any plain ground; but in a rough or deep road must be attended with more pain than pleasure.

Another contrivance for being carried without draught, is by means of a sailing chariot or boat fixed on four wheels, as AB; which is driven before the wind by the sails CD, and guided by the rudder E. In a chariot of this kind, the wheels should be farther asunder, and the axle-trees longer, than in other carriages, to prevent overturning.

56
To sail as fast, with a fair wind, by land, as by water. Fig. 87.

A machine of this sort was constructed in the last century by Stephinus, at Scheveling in Holland, and is celebrated by many writers. Its velocity with a strong wind is said to be so great, that it would carry eight or ten persons from Scheveling to Putten, which is 42 English miles distant, in two hours.

Carriages of this kind are said to be frequent in China; and in any wide, level country, must be sometimes both pleasant and profitable. The great inconvenience attending this machine is, that it can only go in the direction the wind blows, and even not then unless it blow strong: so that, after you have got some way on your journey, if the wind should fail, or change, you must either proceed on foot or go back. Some remedy for this inconvenience will be found in the next contrivance. The Hollanders have, or had, small vessels, something of this kind, that carry one or two persons on the ice, having a sledge at bottom instead of wheels: and being made in the form of a boat, if the ice break the passengers are secured from drowning.

To sail against the wind: Let ABCD be the body of a sailing chariot: M the mast, to which are fixed the wings or sails EFGH; the two first of which, EF, are here supposed to be expanded by the wind; R is the rudder by which it is guided. Therefore the wind driving

57
To sail by land against the wind. Fig. 88.

(A) This machine was invented by M. Richard, a physician of Rochelle, and was exhibited at Paris in the last century. It is described by M. Ozanam in his *Recreations Mathematiques*.

Wheel
carriages.

driving the sails round, with the mast M, and the cog-wheel K, take the teeth placed perpendicular to the sides of the two fore-wheels of the carriage, and consequently keep it in continual motion.

The body of this machine should not be large, nor placed very high, not only to prevent overturning, but that its motion may not be thereby impeded; for the velocity will be in proportion to the force of the wind on the sails to that on the body of the machine. Therefore, if they be both equal, it will stand still; or if the force on the body be greatest, it will go backwards; unless there be a contrivance to lock the wheels. The upper part of the machine next A, may be made to take off when the wind is contrary; and there may be another set of sails placed between the two hind-wheels, which will considerably increase its velocity. But after all, for general use, a common carriage must be preferable; for this cannot be expected to go up a moderate ascent without great difficulty; nor down a declivity, when there is a strong wind, without danger; and even on level ground, if the road be in any degree rough, its progress must be very slow, attended both with difficulty and danger. In an open country, however, where there is a large tract of level and smooth ground, and frequent strong winds, a machine of this sort will certainly be very convenient; and in most countries, when made of a small size, may be useful to young people, by affording them a pleasant and healthful exercise.

58
The unin-
vertible car-
riage.
Fig. 89.

A carriage, the body of which is incapable of being overturned, may be made as follows. The body must consist of a regular hollow globe, as A.B., at the bottom of which is to be an immovable weight, and which must be proportioned to the number of persons or the load the machine is intended to carry. Round the globe must go two horizontal iron circles D, E, and two others F, G, that are perpendicular to the former. All these circles must be made exactly to fit the globe, that it may move freely in every direction. The two horizontal circles are to be joined on each side by a perpendicular bar, one of which is expressed in the figure by H.I. All these irons should be lined with leather, to prevent unnecessary friction. The body of the carriage may be either of leather or hard wood; but the latter will be most eligible, as least liable to wear. The wheel on each side is to be fastened to the perpendicular bar by means of a handle K that keeps it steady.

Now the body of this machine moving freely in the iron circles every way, the centre of gravity will always lie at C; therefore, in whatever position the wheels are, or even if they overturn, the body of the carriage will constantly remain in the same perpendicular direction.

At L is placed a pin, round which is a hollow moveable cylinder: this pin moves up and down in the groove MN, that it may not impede the perpendicular motion of the circles, at the same time that it prevents the body of the machine from turning round in a horizontal direction. O is one of the windows, P the door, and QR the shafts to this machine.

When a carriage of this sort is intended for a single person, or a light weight, it may be hung on swivels, in the same manner as the rolling lamp or the sea-com-

pass, which will make its horizontal motion still more regular: and when it is designed to carry several persons, by adding another perpendicular bar on each side, between the two horizontal circles, it may be placed on four wheels. The body of this machine should be frequently oiled or greased, not only to prevent any disagreeable noise that may arise from its rubbing against the circles, but to prevent unnecessary wear in the several parts.

This carriage is not intended for smooth roads, or a regular pavement; there certainly, those of the common construction are much preferable; nor should a carriage totally free from irregular motion be sought after by those who are in perfect health: but there are many persons, subject to different disorders, who by being obliged to travel over rough roads in the common carriages, suffer tortures of which the healthful have no idea; to all these, therefore, and to every one who is forced to travel through dangerous roads, a carriage of this sort must doubtless be highly desirable.

As this design may appear to some persons, on a superficial view, impracticable, we shall here insert an account of a similar carriage, which we have taken from the first volume of the Abridgement of the Philosophical Transactions, by Lowthorp. There is not, however, any description of the manner in which that machine was constructed. The account is as follows: "A new sort of calash described by Sir R. B. This calash goes on two wheels; carries one person; is light enough. Though it hangs not on braces, yet it is easier than the common coach. A common coach will overturn if one wheel go on a superficies a foot and a half higher than the other; but this will admit of the difference of three feet and one-third in height of the superficies, without danger of overturning. We chose all the irregular banks, and sides of ditches, to run over; and I have this day seen it, at five several times, turn over and over, and the horse not at all disordered. If the horse should be in the least unruly, with the help of one pin you disengage him from the calash without any inconvenience (*a contrivance of this sort may be easily added to the foregoing design*). I myself have been once overturned, and knew it not till I looked up and saw the wheel flat over my head: and if a man went with his eyes shut, he would imagine himself in the most smooth way, though at the same time there be three feet difference in the height of the ground of each wheel."

SECT. V. Of Mills.

MILL, in the proper sense of the word, signifies a machine for grinding corn, though, in a more general sense, it is applied to all machines which have an horizontal circulatory motion. Mills are distinguished by particular names, sometimes taken from the powers by which they are moved, and sometimes from the uses to which they are applied. Hence they are called hand-mills, horse-mills, water-mills, fulling-mills, wind-mills, corn-mills, levigating mills, boring-mills, &c.

The most simple of these is the *hand mill*, represented fig. 90, where A and B represent the two stones between which the corn is ground, and of which the upper one A turns round, but the lower one (B) remains

Wheel-
carriages.

59
A hand-
mill.

Mills.

mains fixed and immoveable. The upper stone is five inches thick, and 21 inches broad; the lower one somewhat broader. C is a cog-wheel, having 16 or 18 cogs, which go into the trundle F, having nine spokes fixed to the axis G, the latter being firmly inserted into the upper stone A, by means of a piece of iron. H is the hopper into which the corn is put; I the shoe to carry it by little and little through a hole at K, in betwixt the stones, where being ground into meal, it comes out through the eye at L. Both stones are inclosed in a circular wooden case, of such a size as will admit the upper one to run freely within it.—The under surface of the upper stone is cut into grooves, as represented at Q, which enable it to throw the meal out at the eye L more perfectly than could be done if it was quite plain. Neither of them are entirely flat, the upper one being somewhat concave, and the under one convex. They nearly touch at the edges, but are at some distance in the middle, in order to let the corn go in between them. The under stone is supported by strong beams, not represented in the figure; the spindle G stands on the beam MN, which lies upon the bearer O. One end of this bearer rests upon a fixed beam, and the other has a string fixed to it, and going round the pin P, by the turning of which the timbers O and MN may be raised or lowered, and thus the stones put nearer, or removed farther from each other, in order to grind fine or coarse. When the corn is to be ground, it must be put into the hopper by little at a time. A man turns the handle D, and thus the cog-wheel and trundle are carried round also together with the stone A. The axis G is angular at K; and, as it goes round, shakes the shoe I, and makes the corn fall gradually through the hole K. The upper stone going round grinds it, throwing out the meal, as already said, at the eye L. Another handle, if thought proper, may be put at the other end of the handle E. The spindle must go through both stones, in order to reach the beam MN, and the hole through which it passes is fastened with leather or wood, so that no meal can pass through. Mr Emerson, from whom this account is taken, observes, that “it is a pity some such mills are not made at a cheap rate, for the sake of the poor, who are much distressed by the roguery of the millers.”

60
Horse-mill.

The construction of a horse-mill differs not from that of the hand-mill just described, excepting that instead of the handle D, the spindle is furnished with a long horizontal lever and cogged wheel, which turns the trundle and stones, as already mentioned.—The stones are much heavier than in the hand-mill.

61
Water-mills.

The mills most commonly in use for grinding corn are water-mills, the construction of which is not essentially different from that of the hand or horse-mills.—The lower mill-stone, as already mentioned, is fixed, but the upper one moveable upon a spindle. The opposite surfaces of the two stones are not flat, but the one convex and the other concave, though in a very small degree. The upper stone, which is six feet in diameter, is hollowed only about an inch in the middle, and the other rises three quarters of an inch. They approach much nearer each other at the circumference, and the corn begins to be ground about two thirds of the radius distant from the circumference, and there it makes the greatest resistance, the space between the

N^o 199.

two stones being in that place only about two-thirds or three-fourths of the thickness of a grain of corn; but as these stones, as well as those of the hand-mill or horse-mill, can be separated a little from each other, the meal may be made fine or coarse in them, as well as in the two former mills.

In order to cut and grind the corn, both the upper and under stones have furrows cut in them, as is observed in the hand-mill. These are cut perpendicularly on one side, and obliquely upon the other, by which means each furrow has a sharp edge, and by the turning of the stones, the furrows meet like a pair of scissars, and by cutting the corn, make it grind the more easily. They are cut the same way in both stones when they lie upon their backs, by which means they run crosswise to each other when the upper one is inverted and turned round; and this greatly promotes the grinding of the corn, great part of which would be driven onward in the lower furrows, without being ground at all, if both lay the same way.—When the furrow becomes blunt and shallow by wearing, the running stone must be taken off, and the furrows cut deeper in both by means of a chissel and hammer. Thus, however, by having the furrows cut down a great number of times, the thicknesses of both stones are greatly diminished; and it is observed, that in proportion to the diminution of the thickness of the upper stone, the quantity of flour also diminishes.

By means of the circular motion of the upper stone, the corn is brought out of the hopper by jerks, and recedes from the centre towards the circumference by the centrifugal force; and being entirely reduced to flour at the edges when the stones nearly touch one another, it is thrown at last out at the hole called the eye, as already mentioned. In Scotland, it is frequent to have the stones without any furrows, and only irregularly indented with small holes, by means of an iron instrument. Stones of this kind last a much shorter time than those with furrows, the latter being fit for use for 30 or 40 years, while the former seldom or never last more than seven. The under mill-stone is considerably thicker than the upper; and therefore, when both have been considerably worn by use, the lower one is frequently taken up, and the upper one put in its place, the former being converted into a running-stone.

Fig. 91 shows the construction of a common water mill, where AA is the large water-wheel, commonly about 17 or 18 feet diameter from *a*, the extremity of any float-board, to *b* the extremity of the opposite one. This wheel is turned round by the falling of the water upon the boards from a certain height, and the greater the height, provided the water runs in an uninterrupted stream, the smaller quantity will be sufficient to turn the mill. This wheel is without the mill-house, but the wheel has an axle BB of considerable length, which passes through a circular hole in the wall, and has upon it a wheel D, of eight or nine feet diameter, having 61 cogs, which turn a trundle E of ten flaves or spokes; by which means the trundle, and consequently the mill-stone, will make six revolutions, and one-tenth for every revolution of the wheel. The odd cog, commonly called the *hunting cog*, is added, that as every one comes to the trundle it may take the staff behind that one which it took at the last revolution;

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Of water-mills.Plate
CCCLXXXIX.

Fig. 91.

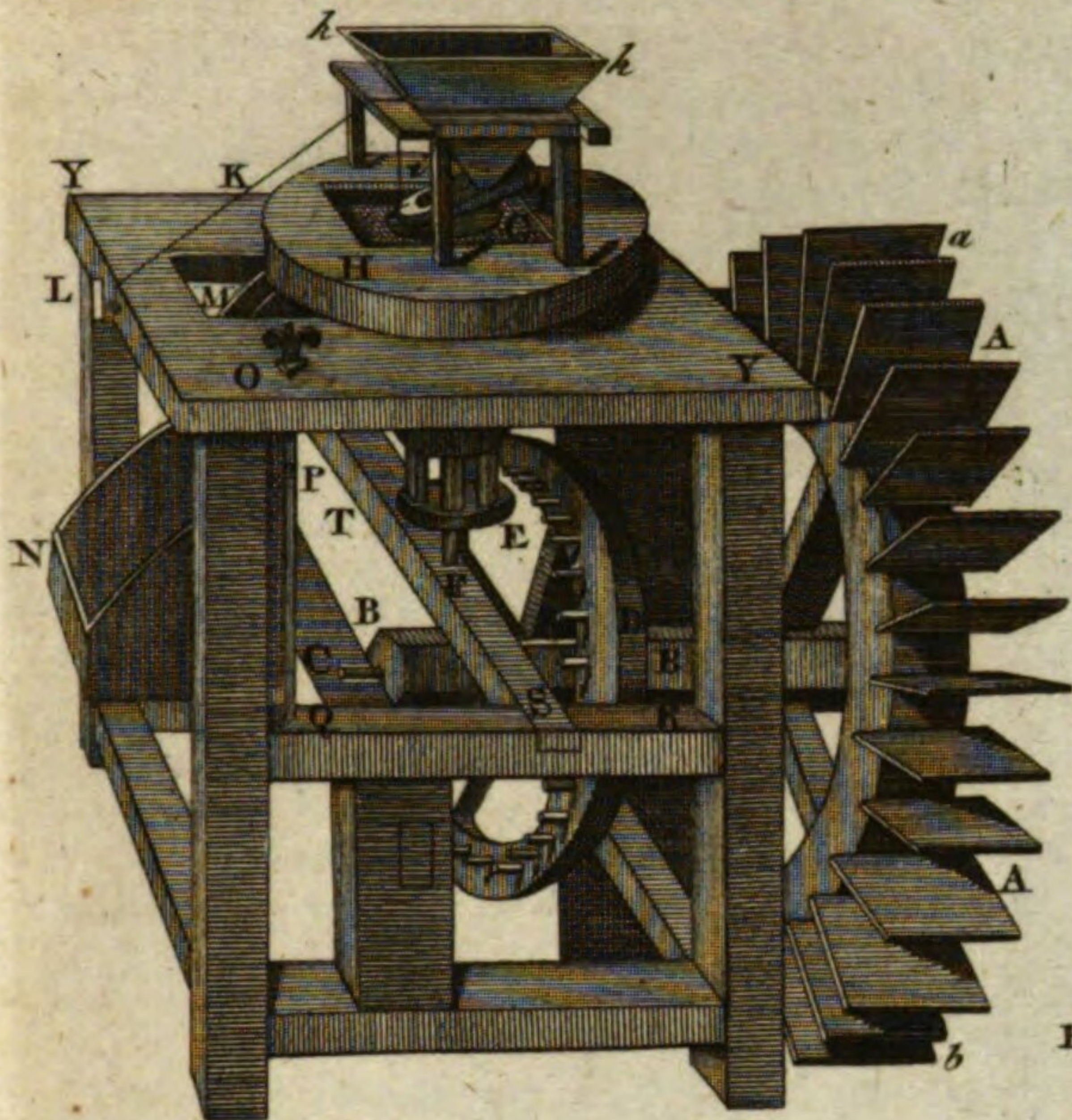


Fig. 93.

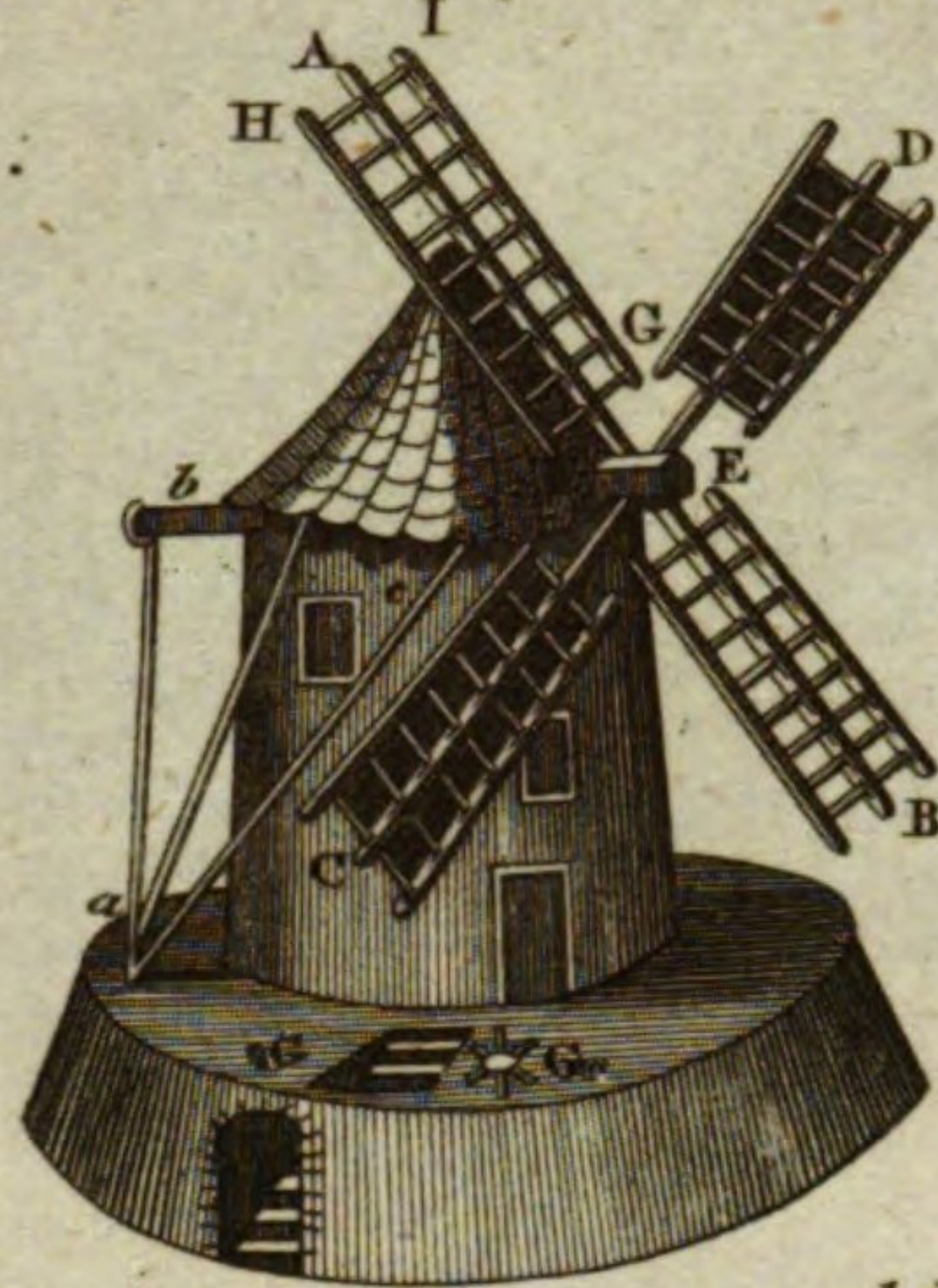


Fig. 92.



Fig. 99.

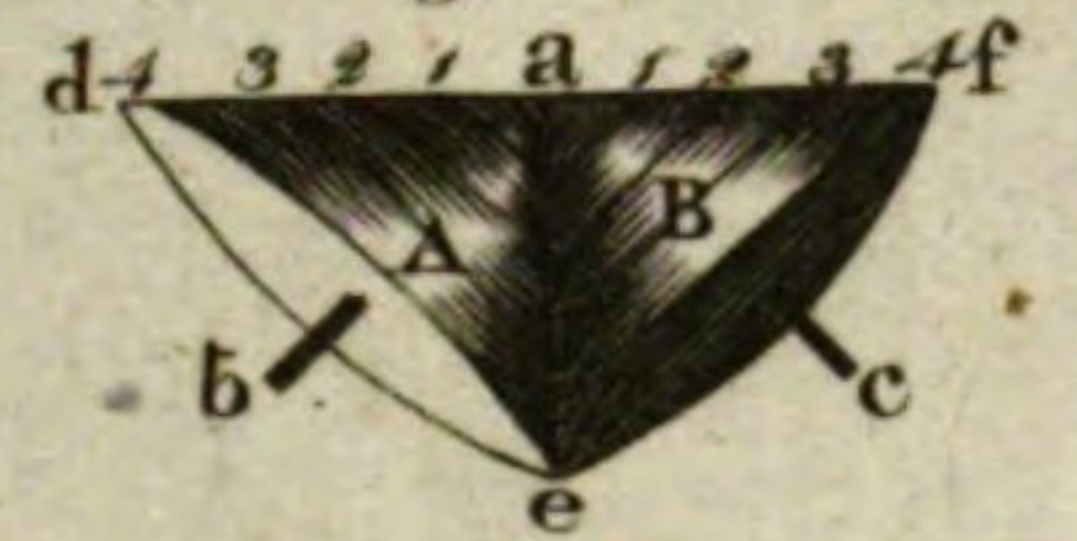


Fig. 95.

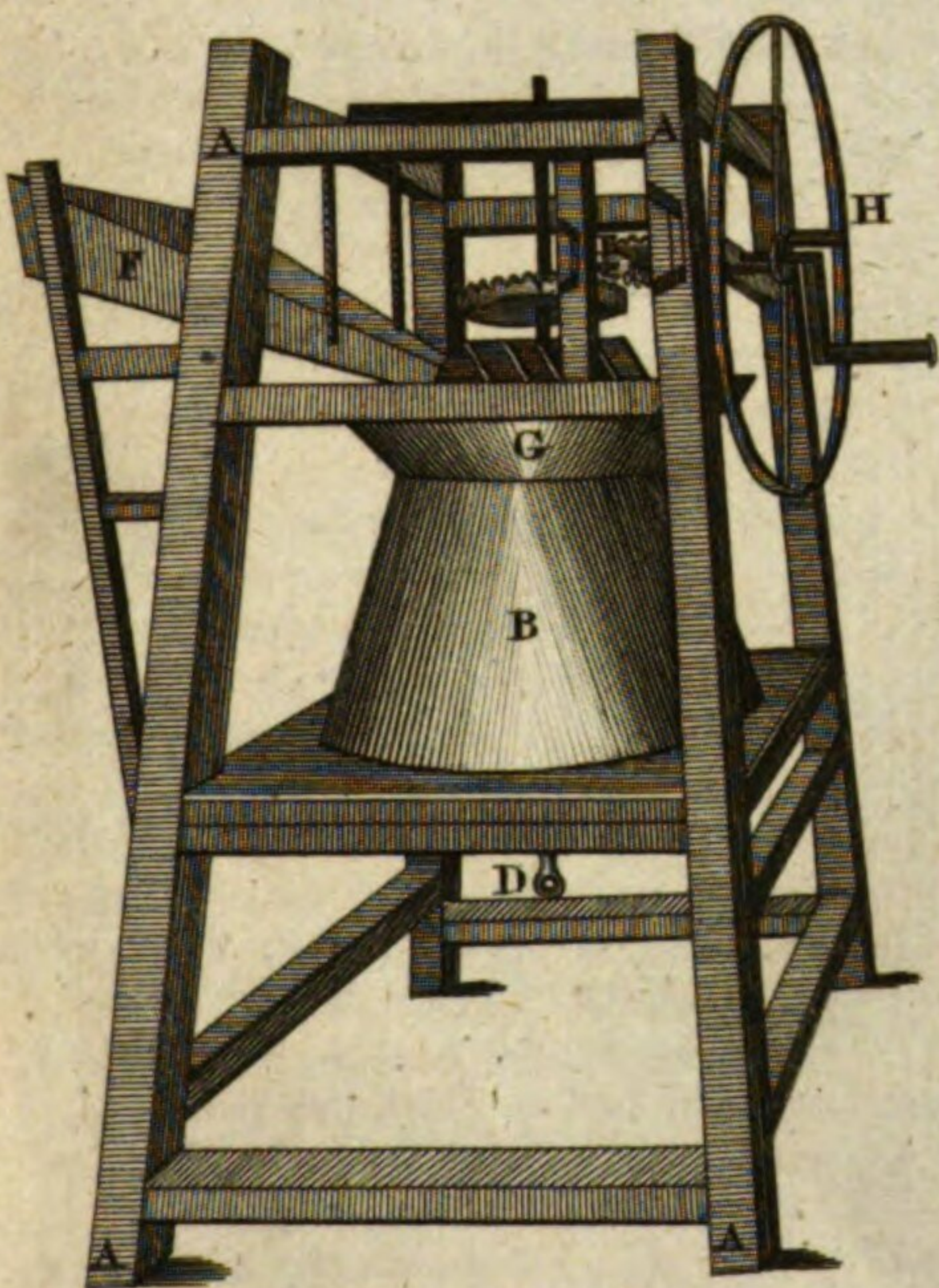


Fig. 94.

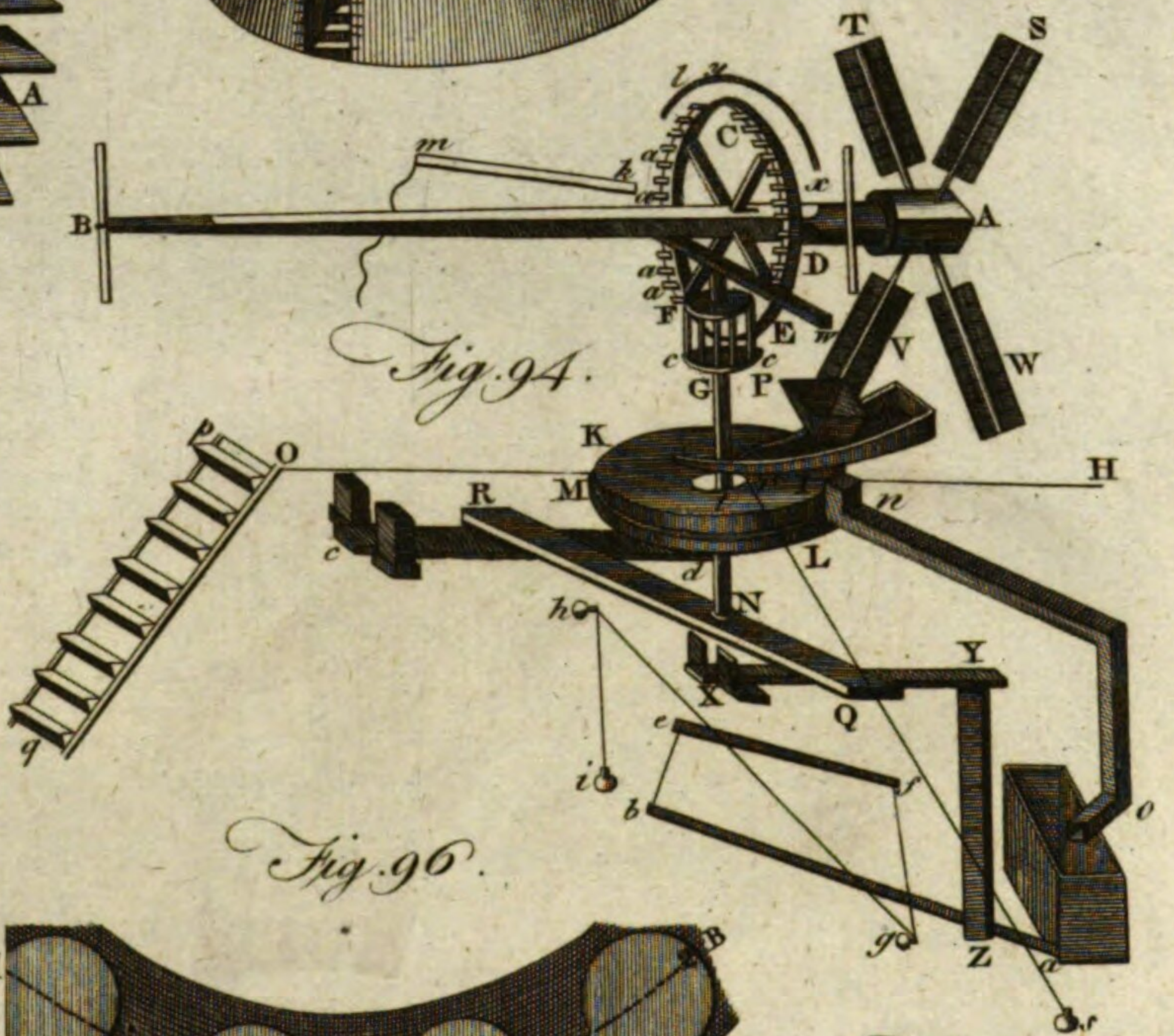


Fig. 96.

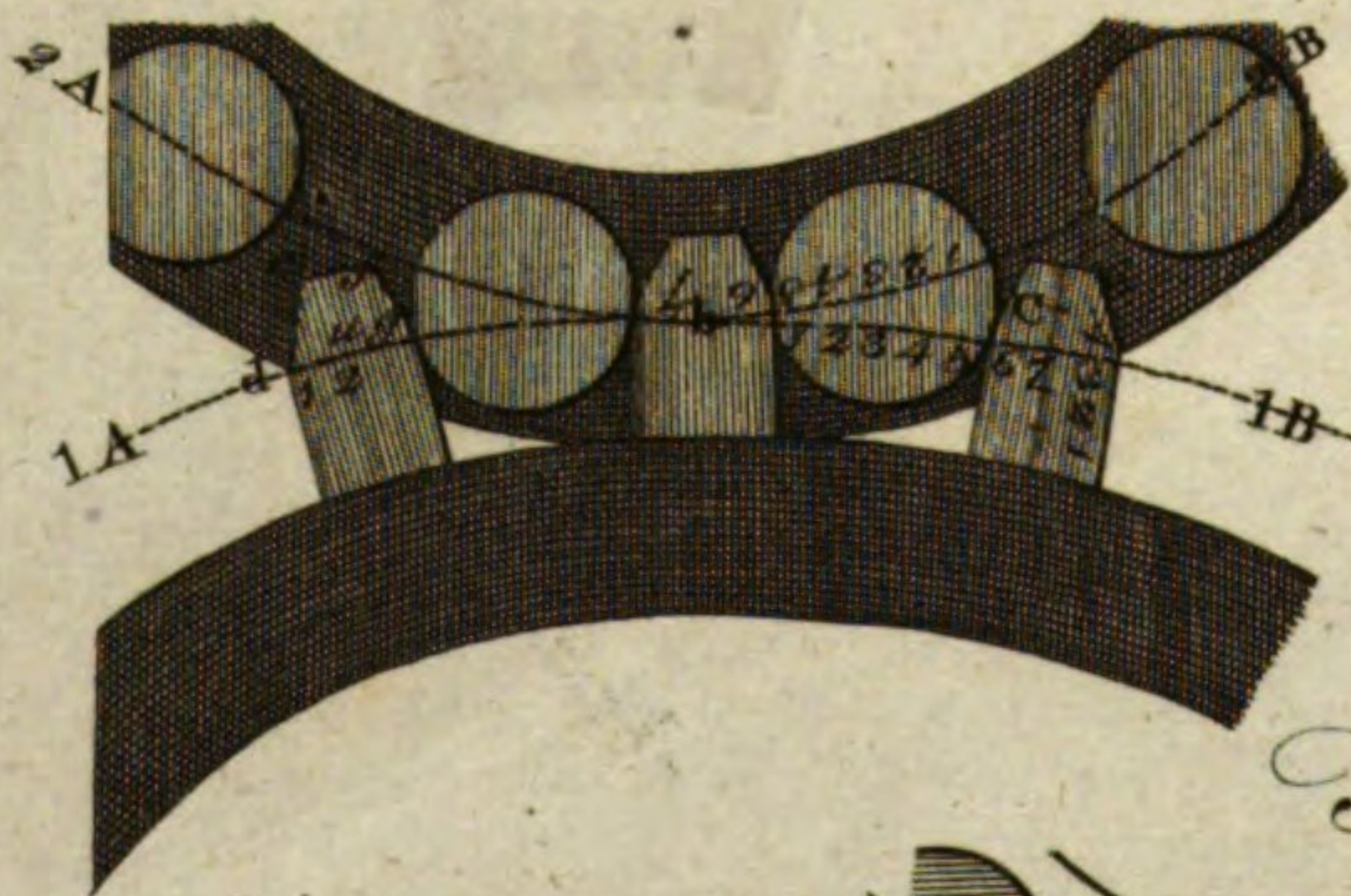


Fig. 100.



Fig. 98.

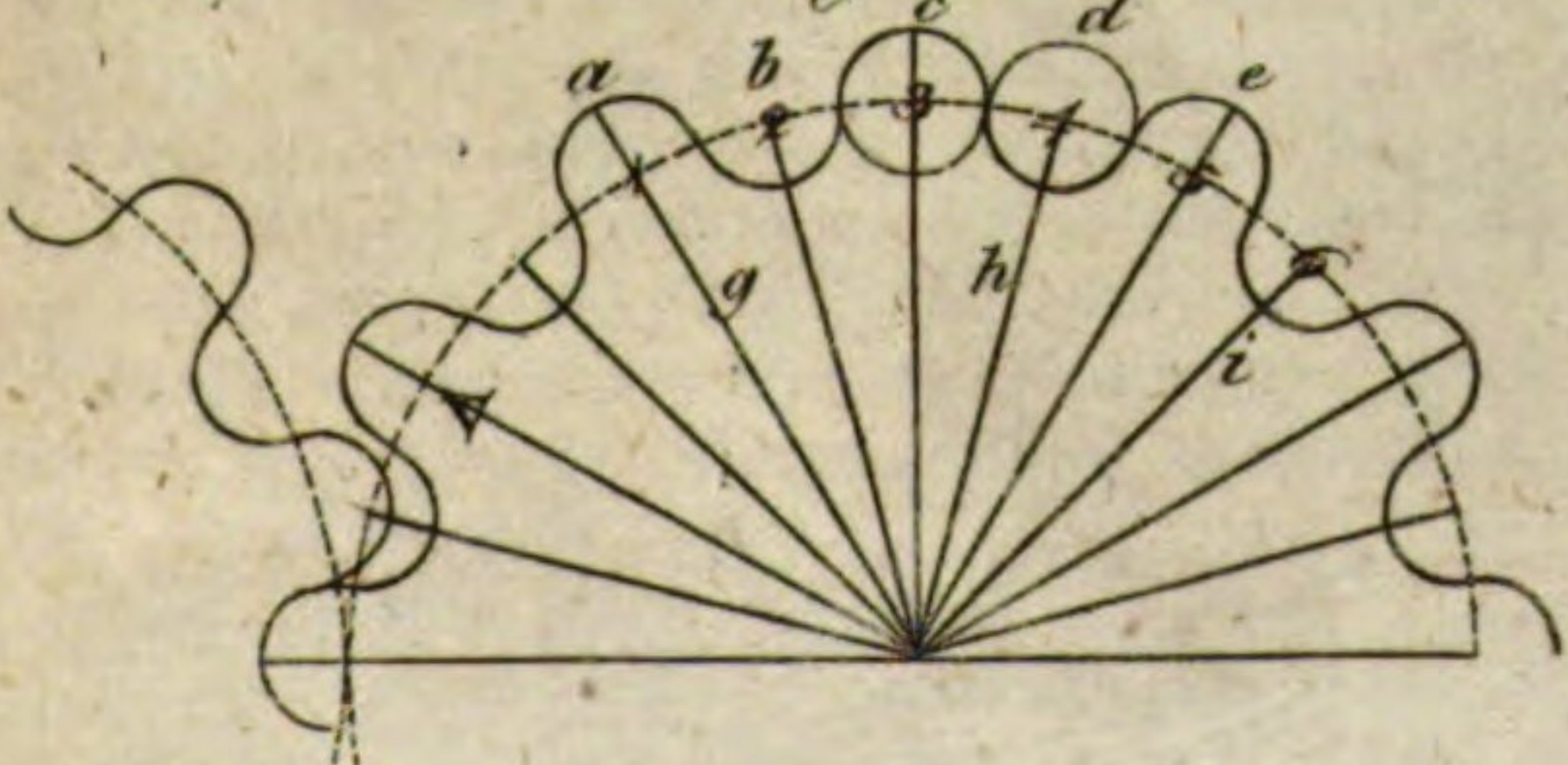
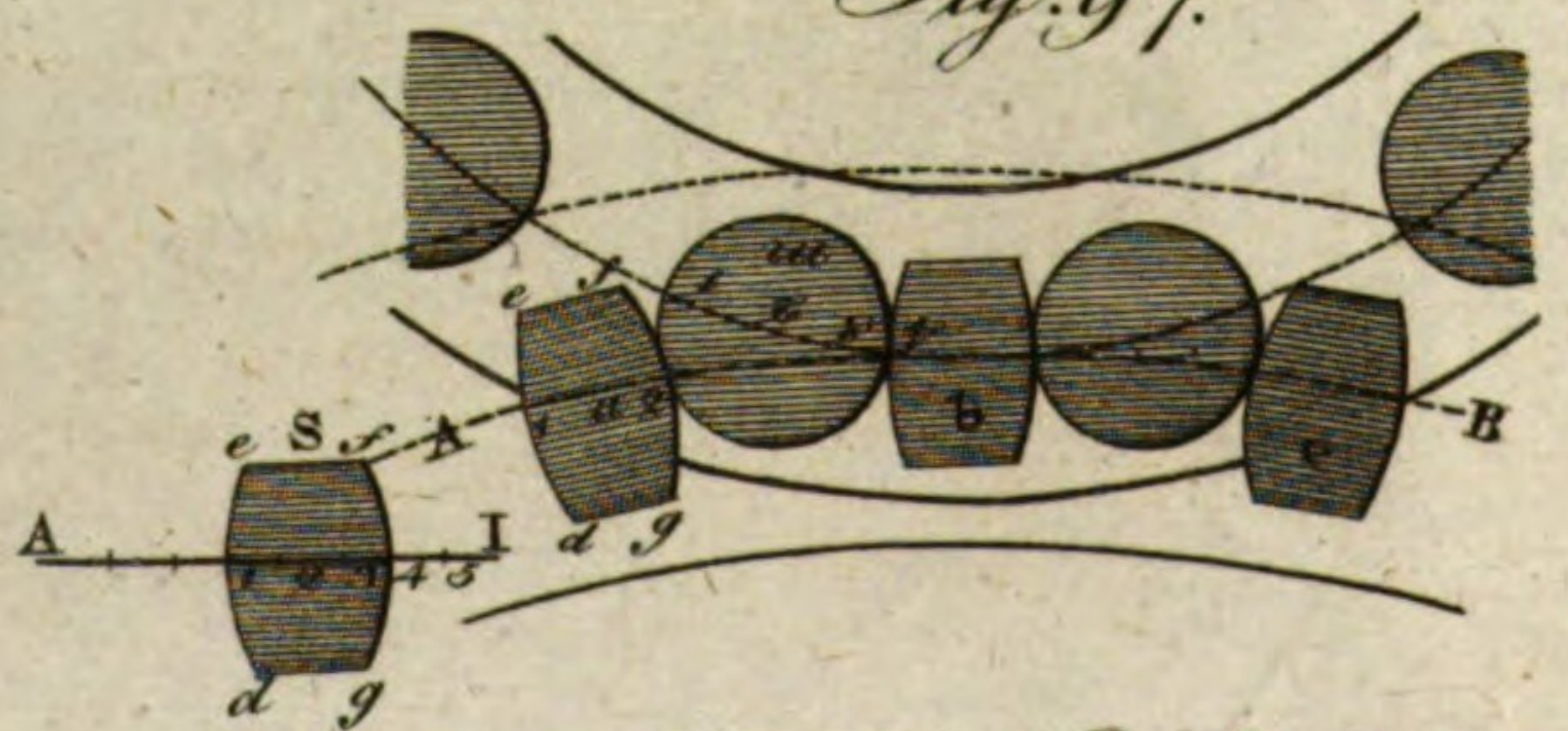


Fig. 97.



Mills.

Mills.

tion; and thus all the parts of the cogs and rounds which work upon one another will wear equally, and to equal distances from another, in a little time; by which means a true uniform motion will be produced through the whole work. The trundle is fixed upon an iron axis called the spindle, the lower end of which turns in a brass pot fixed at F in the horizontal beam ST, called the *bridge-tree*; and the upper part of the spindle turns in a wooden bush, fixed into the lower mill-stone, which lies upon beams in the floor YY. The top part of the spindle above the bush is square, and goes into a square hole in a strong iron cross *abcd*, fig. 92, called the *rynd*; under which, and close to the bush, is a round piece of thick leather upon the spindle, which it turns round at the same time that it does the *rynd*. The latter enters into the grooves in the under surface of the running mill-stone G, fig. 91, and thus turns it round along with the trundle E, by means of the cog-wheel D. In the middle of the upper mill-stone is a large hole called the *eye*, through which the middle part of the *rynd* and upper part of the spindle may be seen; the ends being hid in the grooves below the stone. The end T of the bridge-tree TS, which supports the upper mill-stone G upon the spindle, is fixed into a hole in the wall; and the end S is let into the beam QR called the *brayer*; one end R of which remains fixed in a mortise, while the other end Q hangs by a strong iron rod P, which goes through the floor YY, and has a screw-nut on its top O; by the turning of which nut the end Q of the brayer is raised or depressed at pleasure, along with the bridge-tree TS and upper mill-stone. Thus the upper mill-stone may be raised as high from the under one, or let down as close to it, as the miller pleases; by which means the meal or flour is made either coarse or fine at pleasure. The upper mill-stone G is inclosed in a round box H, which leaves a vacant space of about an inch all round. On the top of this box stands a frame for holding the hopper *kk*, at which hangs the shoe I, by two lines fastened to the hinder part of it, fixed upon hooks in the hopper, and by one end of the string K to the fore part of it at *i*, the other end being twisted round the pin L. As the pin is turned one way, the string draws up the shoe closer to the hopper, and so lessens the aperture between them; and as the pin is turned the other way, it lets down the shoe, and widens the aperture. If it be drawn quite up to the hopper, no corn can fall out from the latter into the mill, and the quantity will be greater or less as the shoe is farther from the hopper or nearer to it. This happens by reason of the hopper being open at bottom, and the shoe at the forepart towards the end *i* over the middle of the eye of the mill-stone. There is also a square hole in the top of the spindle, in which is put the feeder *e*, fig. 92. Thus the shoe is jogged three times in each revolution, and the corn runs constantly down from the hopper through the shoe into the eye of the mill-stone, where it falls upon the top of the *rynd*, and, by the motion of that and of the leather beneath, is introduced betwixt the stones, and by the violent motion of the upper one acquires a centrifugal force; and proceeding gradually from the eye of the mill-stone towards the circumference, is thrown at last out in flour, at the hole called the eye of the mill.

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Some degree of nicety is requisite in feeding the mill; for if too great a quantity be poured into it, the stones are separated from each other more than they ought to be, and their motion is also impeded; while, on the other hand, if it be fed too slowly, the stone moves with too great velocity, and the attrition of the two is apt to make them strike fire. This matter is regulated by turning the pin L backwards or forwards as the miller thinks proper.

Sometimes, where plenty of water can be had, there are two trundles applied to the cog-wheel by means of a single large one turned immediately by the perpendicular cog-wheel, and carrying round with it an horizontal cogged wheel; on each side of which are placed the smaller trundles above-mentioned carrying the stones. In like manner, the water-wheel may be made to drive fanners, boulting-mills, &c. but it must always be remembered, that by complicating machinery to a great degree, it becomes more ready to give way; and the frequent reparation of which it stands in need, will, by the delay of business, be found at last more expensive than if separate machines had been used.

The wind-mill is furnished with an apparatus similar to the water-mill, but necessarily differs in the external apparatus for applying the power. This is done by means of the two arms AB and CD, fig. 93, intersecting each other at right angles in E, and passing through the axis EF, and about 32 feet in length. On these yards are placed two sails or vanes, in the shape sometimes of parallelograms, and sometimes of trapeziums, with parallel bases; the greater whereof HI is about six feet, and the length of the smaller FG is determined by radii drawn from the centre E to I and H.

As the direction of the wind is very uncertain, it becomes necessary to have some contrivance for turning the sails towards it, in order to receive its force in whatever way it may turn; and for this purpose two general methods are in use. In the one, the whole machine is sustained upon a moveable arbor or axis, perpendicular to the horizon, and which is supported by a strong stand or foot very firmly fixed in the earth; and thus by means of a lever the whole machine may be turned round as occasion requires. In the other method, only the roof, which is circular, can be turned round by means of a lever and rollers, upon which the circular roof moves. This last kind of wind-mill is always built of stone, in the form of a round turret, having a large wooden ring on the top of it, above which the roof, which must likewise be of wood, moves upon rollers, as has been already mentioned. To effect this motion the more easily, the wooden ring which lies on the top of the building is furnished with a groove, at the bottom of which are placed a number of brass truckles at certain distances, and within the groove is placed another ring, by which the whole roof is supported. The beams *ab* and *ae* are connected with the moveable ring, and a rope is fastened to the beam *ab* in *b*, which at the other extremity is fitted to a windlass or axis in peritrochio; and this rope being drawn through the iron hook G, and the windlass turned round, the sails and roof will be turned round also, in order to catch the wind in any direction. Both these methods of construction have their advantages and disadvantages. The former is the least expensive, as the whole may be made of wood,

Mills.

wood, and of any form that is thought proper; while the other requires a costly building of stone: and the roof being round, the building must also be so, while the other can be made of any form, but has the inconvenience of being liable to be carried off altogether by a very high wind, of which an instance occurred not long ago in Essex.

Fig. 94. shows the internal mechanism of a wind-mill. AHO is the upper room; H_oZ the lower one; AB the axle-tree passing through the mill; STVW the sails covered with canvas set obliquely to the wind, and turning round in the order of the letters. CD is the cog-wheel, having about 48 cogs *a a a*, &c. which carry round the lantern EF, having eight or nine trundles *c c c*, &c. along with the axis GN. IK is the upper mill-stone, LM the lower one; QR is the bridge supporting the axis or spindle GN, which rests upon the beams *c d*, XY, wedged up at *c*, *d*, and *X*: ZY is the lifting tree, which stands upright; *ab* and *ef* are levers, having Z and *e* as centres of motion; *fighi* is a cord, with a stone *i* wound about the pins *g* and *h*, and which thus serves as a balance or counterpoise. The spindle *t* N is fixed to the upper mill-stone IK by means of a piece of iron called the *rynd*, and fixed in the lower side of the stone, the whole weight of which rests upon a hard stone fixed in the bridge QR at N. The trundle EF and axis G may be taken away; for it rests its lower part by *t* in a square socket, and the top runs in the edge of the beam *uv*. By bearing down the end of the lever *fe* we raise *b*, which raises also ZY, and this raises YX, which lifts up the bridge QR, with the axis NG, and the upper stone IK; so that by this contrivance the stones may, as in a water-mill, be set at any distance. The lower stone is fixed upon strong beams, and is broader than the upper one; the flour being conveyed through the tunnel *no* into a chest. P is the hopper into which the corn is put, and which runs along the spout *r* into the hole *t*, and so falls between the stones, where it is ground. The square axis G *t* shakes the spout *r* as it turns round, and makes the corn run out; *r* is a string going round the pin *s*, which serves to bring the spout nearer or let it go farther from the axis, and thus makes the corn to run faster or slower according to the velocity of the wind. If the wind be very strong, only part of the sails S, T, V, W, is covered, or perhaps only one half of the two opposite sails. Another cog-wheel B is placed towards the end B of the axle tree, with a trundle and mill-stones like those already described; so that when the wind is strong, the mill may do twice the business it ordinarily does. When only one pair is to grind, the trundle EF and axis G *t* are taken out from the other: *xyl* is a girt of pliable wood, fixed at the end *x*; and the other end *l* is tied to the lever *km*, moveable about *k*; and the end *m* being put down, draws the girt *xyl* close to the cog-wheel; and thus the motion of the mill may be stopped at pleasure: *pq* is a ladder for ascending to the higher part of the mill; and the corn is drawn up by means of a rope rolled about the axis AB.

63
A threshing
mill.

Besides these mills for grinding corn, one has lately been invented by a Mr Winlaw for threshing it out, and for which he has obtained a patent. It is represented fig. 95. A A A A represents the frame of the

Mills.

mill, B the cone, C a large iron wheel, D a regulating screw, E a pinion, G the top curb surrounding the nut, H the fly.

Before the corn is put into this mill, it must undergo the operations of combing the bottoms of the sheaves, and stripping the ears from the straw. The former is performed by means of an hand-comb. The use is obvious, viz. to take out all the loose ears, and straw laid irregularly, which would otherwise be lost, or impede the stripping of the ears. The comb for stripping the ears is made in the form of a cross. The teeth are of an angular form, and set at convenient distances, so as to strip the ears clean. If set too wide, they will pass through without effect; and if too near together, they will not admit the straw to go between them.

The grain is separated from the chaff and straw of the ear by the motion of the inner nut within the outward cone. The distance betwixt these is adjusted by the regulating screw D at the bottom; for if this be screwed up too far, the grain will be bruised, if too far lowered down, the grain will not be separated. The dart marked upon the fly shows the direction in which the handle is to be turned, it being pointed as the handle is to be turned.

This mill was tried in the month of June 1785, in the presence of a number of gentlemen, with great satisfaction to the spectators; and since that time has been used by a number of others, though it has not as yet come into general use. At the first trial there passed through the mill one bushel of heads per minute, with very moderate labour to the man who turned it; and by experiment it was found, that four bushels of ears yielded one bushel of clean grain. Hence it appears, that the difference betwixt the expedition of the mill and the labour of the thresher is immensely great; for allowing that a man will thresh six bushels per day at eight hours work, the mill will clear that quantity in 24 minutes, and that to much greater perfection than can be done by the flail, as it separates every grain from the ear, which cannot but be accounted a very great saving; while much corn flies off by the flail, and a great deal is lost by foul threshing, either when performed by task or day-work. But by the use of the mill, all fraudulent practices must be prevented, the straw preserved in its original reed, and thus answer the purposes of thatching, &c. much better than when bruised under the flail; and every other purpose equally well. The ears may also be combed out with great expedition, as a lad without having practised was found to comb out a bushel of ears in 20 minutes, which is at the rate of six bushels of clean corn per day. — The saving by the use of this mill is calculated at 2½d. per bushel. On a smaller scale the mill answers equally well for clover-seed, the flowers being first combed off from the stems; after which it will do as much work in three hours, as a man in the ordinary way can perform in a week; for a man cannot clean much above a bushel in that time, which is the great reason of the high price of clover-seed. The mill will likewise answer for flax, canary, or any other seeds, or for separating the husks from rice, which in the present mode cannot be done without great labour and expence.

In all mills it is necessary that a considerable power
be

Mills. be employed in order to accomplish the intended purpose. Water is the most common power, and indeed the best, as being the most constant and equable; while wind comes at sometimes with great violence, and at others is totally gone. Mills may also be moved by the force of steam, as were the Albion-mills at London; but the expence of fuel must undoubtedly prevent this mode of constructing mills from ever becoming general. In all cases it is absolutely necessary to make the most of the power that we can, by making it act to the greatest advantage. Hence the best methods of constructing water and wind-mills have been investigated by those who were most conversant in the principles of mechanics; and so difficult has been the investigation, that the principles are not yet settled absolutely without dispute.

64
Different
kinds of
mills.

The water-mills are of three kinds: *Breast-mills*, *Undershot-mills*, and *Overshot-mills*. In the former, the water falls down upon the wheel at right angles, to the float-boards or buckets placed all round the wheel to receive it: if float-boards are used, it acts only by its impulse; but if buckets, it acts also by the weight of water in the buckets in the under quarter of the wheel, which is considerable. In the undershot wheel float-boards only are used, and the wheel is turned merely by the force of the current running under it, and striking upon the boards. In the overshot-wheel the water is poured over the top, and thus acts principally by its weight; as the fall upon the upper part of the wheel cannot be very considerable, lest it should dash the water out of the buckets. Hence it is evident, that an undershot-mill must require a much larger supply of water than any other; the breast-mill the next, unless the fall is very great; and an overshot mill the least. Dr Defaguliers found, that a well-made overshot mill would perform as much work as an undershot one with one tenth part of the quantity of water required by the other.

65
Smeaton's
observations
on
mills.

In the 51st volume of the Philosophical Transactions, Mr Smeaton has considered at great length the best methods of constructing all these mills from machines and models made on purpose: but conscious of the inferiority of *models* to actual practice, did not venture to give his opinion without having seen them actually tried, and the truth of his doctrines established by practice.

Having described the machines and models used for making his experiments, he observes, that, with regard to power, it is most properly measured by the raising of a weight; or, in other words, if the weight raised be multiplied by the height to which it can be raised in a given time, the product is the measure of the power raising it; and, of consequence, all those powers are equal whose products made by such multiplication are equal: for if a power can raise twice the weight to the same height, or the same weight to twice the height in the same time that another can, the former power will be double the latter; but if a power can only raise half the weight to double the height,

or double the weight to half the height, in the same time that another can, the two powers are equal. This, however, must be understood only of a slow and equable motion, without acceleration or retardation; for if the velocity be either very quickly accelerated or retarded, the *vis inertiae*, in our author's opinion, will produce an irregularity.

To compute the effects of water-wheels exactly, it is necessary to know in the first place what is the real velocity of the water which impinges on the wheel. 2. The quantity of water expended in a given time: and, 3. How much of the power is lost by the friction of the machinery.

1. With regard to the velocity of the water, Mr Smeaton determined by experiments with the machinery described in the volume referred to, that with a head of water 15 inches in height, the velocity of the wheel is 8.96 feet in a minute. The area of the head being 105.8 inches, this multiplied by the weight of a cubic inch of water equal to .579 of an ounce avoirdupoise, gives 61.26 ounces for the weight of as much water as is contained in the head upon one inch in depth: and by further calculations derived from the machinery made use of, he computes that 264.7 pounds of water descend in a minute through the space of 15 inches. The power of the water, therefore, to produce mechanical effects in this case will be 264.7×15 , or 3970. From the result of the experiment, however, it appeared that a vast quantity of the power was lost; the effect being only to raise 9.375 pounds to the height of 135 inches; so that the power was to the effect as 3970 to $9.375 \times 135 = 1266$, or as 10 to 3.18.

This, according to our author, must be considered as the greatest single effect of water upon an undershot-wheel, where the water descends from an height of 15 inches; but as the force of the current is not by any means exhausted, we must consider the true proportion betwixt the power and effect to be that betwixt the quantity of water already mentioned and the sum of all the effects producible from it. This remainder of power, it is plain, must be equal to that of the velocity of the wheel itself multiplied into the weight of the water. In the present experiment, the circumference of the wheel moved with the velocity of 3.123 feet in a second, which answers to a head of 1.82 inches (A); and this height being multiplied by 264.7, the quantity of water expended in a minute gives 481 for the power of the water after it has passed the wheel; and hence the true proportion betwixt the power and the effect will be as 3849 to 1266; or as 11 to 4.

As the wheel revolved 86 times in a minute, the velocity of the water must be equal to 86 circumferences of the wheel; which, according to the dimensions of the apparatus used by Mr Smeaton, was as 86 to 30, or as 20 to 7.—The greatest load with which the wheel would move was 9 lb. 6 oz.; and by 12 lb. it was entirely stopped. Whence our author concludes,

5 D 2

(A) These calculations are founded upon the known maxim in hydrostatics, that the velocity of spouting water is nearly the same with that which an heavy body would acquire by falling from an height equal to that of the reservoir, and is proved by the rising of jets nearly to the height of their reservoirs.

Mills.

cludes, that the impulse of the water is more than than double of what it ought to be according to theory: but this he accounts for by observing, that in his experiment the wheel was placed not in an open river, where the natural current, after it has communicated its impulse to the float, has room on all sides to escape, as the theory supposes, but in a conduit, to which the float being adapted, the water cannot otherwise escape than by moving along with the wheel. It is observable, that a wheel working in this manner, as soon as the water meets the float, receiving a sudden check, it rises up against the float like a wave against a fixed object, insomuch that when the sheet of water is not a quarter of an inch thick before the float, yet this sheet will act upon the whole surface of a float whose height is three inches: and consequently, was the float no higher than the thickness of the sheet of water, as the theory also supposes, a great part of the force would have been lost by the water dashing over the float.

Mr Smeaton next proceeds to give tables of the velocities of wheels with different heights of water; and from the whole deduces the following conclusions.

1. The virtual, or effective head, being the same, the effect will be nearly as the quantity of water expended.

2. The expence of water being the same, the effect will be nearly as the height of the virtual or effective head.

3. The quantity of water expended being the same, the effect is nearly as the square of the velocity.

4. The aperture being the same, the effect will be nearly as the cube of the velocity of the water. Hence, if water passes out of an aperture in the same section, but with different velocities, the expence will be proportional to the velocity; and therefore, if the expence be not proportional to the velocity, the section of the water is not the same.

5. The *virtual* head, or that from which we are to calculate the power, bears no proportion to the head water; but when the aperture is larger, or the velocity of the water less, they approach nearer to a coincidence: and consequently, in the large openings of mills and sluices, where great quantities of water are discharged from moderate heads, the head of water, and virtual head determined from the velocity, will nearly agree, which is also confirmed by experience.

6. The most general proportion betwixt the power and effect is that of 10 to 3; the extremes 10 to 3.2, and 10 to 2.8. But as it is observable, that where the power is greatest, the second term of the ratio is greatest also; whence we may allow the proportion subsisting in great works to be as three to one.

7. The proportion of velocity between the water and wheel is in general about 5 to 2.

8. There is no certain ratio between the load that the wheel will carry at its *maximum*, and what will totally stop it; though the proportions are contained within the limits of 20 to 19, and 20 to 15; but as the effect approaches nearest to the ratio of 20 to 15, or of 4 to 3 when the power is greatest either by increase of velocity or quantity of water, this seems to be the most applicable to large works: but as the load that a wheel ought to have, in order to work to the

best advantage, can be assigned by knowing the effect that it ought to produce, and the velocity it ought to have in producing it, the exact knowledge of the greatest load it will bear is of the least consequence in practice.

Mr Smeaton, after having finished his experiments on the undershot mills, reduced the number of floats, which were originally 24, to 12; which caused a diminution in the effect, by reason that a greater quantity of water escaped between the floats and the floor than before; but on adapting to it a circular sweep of such a length, that one float entered into the curve before the other left it, the effect came so near that of the former, as not to give any hopes of advancing it by increasing the number of floats beyond 14 in this particular wheel.

Our author next proceeds to examine the power of water when acting by its own gravity in turning an overshot wheel: "In reasoning without experiment (says he,) one might be led to imagine, that however different the mode of application is, yet that, whenever the same quantity of water descends through the same perpendicular space, the natural effective power would be equal, supposing the machinery free from friction, equally calculated to receive the full effect of the power, and to make the most of it: for if we suppose the height of a column of water to be 30 inches, and resting upon a base or aperture of one inch square, every cubic inch of water that departs therefrom will acquire the same velocity or momentum from the uniform pressure of 30 cubic inches above it, that one cubic inch let fall from the top will acquire in falling down to the level of the aperture; one would therefore suppose that a cubic inch of water let fall through a space of 30 inches, and there impinging upon another body, would be capable of producing an equal effect by collision, as if the same cubic inch had descended through the same space with a slower motion, and produced its effects gradually. But however conclusive this reasoning may seem, it will appear in the course of the following deductions, that the effect of the gravity of descending bodies is very different from the effect of the stroke of such as are non-elastic, though generated by an equal mechanical power."

Having made such alterations in his machinery as were necessary for overshot wheels, our author next gives a table of experiments with the apparatus so altered. In these the head was 6 six inches, and the height of the wheel 24 inches; so that the whole descent was 30 inches: the quantity of water expended in a minute was $96\frac{2}{3}$ pounds; which multiplied by 30 inches, gives the power = 2900: and after making the proper calculations, the effect was computed at 1914; whence the ratio of the power to it comes to be nearly as 3 to 2. If, however, we compute the power from the height of the wheel only, the power will be to the effect nearly as 5 to 4.

From another set of experiments the following conclusions were deduced.

1. The effective power of the water must be reckoned upon the whole descent; because it must be raised to that height in order to be able to produce the same effect a second time. The ratios between the powers

Mills.

Mills. powers so estimated and the effects at a *maximum*, differ nearly from 4 to 3, and from 4 to 2. Where the heads of water and quantities of it expended are the least, the proportion is nearly from 4 to 3; but where the heads and quantities are greatest, it comes nearer to that of 4 to 2; so that by a medium of the whole the ratio is nearly as 3 to 2. Hence it appears, that the effect of overshot wheels is nearly double to that of undershot ones; the consequence of which is, that non-elastic bodies, when acting by their impulse or collision, communicate only a part of their original impulse, the remainder being spent in changing their figure in consequence of the stroke. The ultimate conclusion is, that the effects as well as the powers are as the quantities of water and perpendicular heights multiplied together respectively.

2. By increasing the head, it does not appear that the effects are at all augmented in proportion; for by raising it from 3 to 11 inches, the effect was augmented by less than one-seventh of the increase of perpendicular height. Hence it follows, that the higher the wheel is in proportion to the whole descent, the greater will be the effect; because it depends less upon the impulse of the head, and more upon the gravity of the water in the buckets: and if we consider how obliquely the water issuing from the head must strike the buckets, we shall not be at a loss to account for the little advantage that arises from the impulse thereof, and shall immediately see of how little consequence this is to the effect of an overshot wheel. This, however, as well as other things, must be subject to limitation; for it is necessary that the velocity of the water should be somewhat greater than the wheel, otherwise the latter will not only be retarded by the striking of the buckets against the water, but some of the power will be lost by the dashing of the water over the buckets.

3. To determine the velocity which the circumference of the wheel ought to have in order to produce the greatest effect, Mr Smeaton observes, that the more slowly any body descends by the force of gravity when acting upon any piece of machinery, the more of that force will be spent upon it, and consequently the effect will be the greater. If a stream of water falls into the bucket of an overshot wheel, it will be there retained till the wheel discharges it by moving round; and of consequence, the slower the wheel moves, the more water it will receive; so that what is lost in velocity is gained by the greater pressure of water upon the buckets. From the experiments, however, it appears, that when the wheel made about 20 turns in a minute the effect was greatest; when it made only $18\frac{1}{4}$ the motion was irregular; and when loaded so as not to admit its turning 18 times, the wheel was overpowered with the load. When it made 30 turns, the power was diminished by about $\frac{1}{10}$ th, and when the number of turns was increased to 40, it was diminished by one-fourth. Hence we see, that in practice the velocity of the wheel should not be diminished farther than what will procure some solid advantage in point of power; because, *ceteris paribus*, the buckets must be larger as the motion is slower; and the wheel being more loaded with water, the stress will be proportionably increased upon every part of the work. The best velocity for practice therefore

Mills. will be that when the wheel made 30 turns in a minute, which is little more than three feet in a second. This velocity is applicable to the highest overshot wheels as well as the lowest. Experience however determines, that high wheels may deviate further from this rule before they will lose their power, by a given aliquot part of the whole, than low ones can be permitted to do; for a wheel of 24 feet high may move at the rate of 6 feet *per* second; while our author has seen one of 33 feet high move very steadily and well with a velocity of little more than two feet. The reason of this superior velocity in the 24 feet wheel, may probably be owing to the small proportion that the head requisite to give the proper velocity to the wheel bears to the whole height.

4. The maximum load for an overshot wheel is that which reduces the circumference of the wheel to its proper velocity; which is known by dividing the effect it ought to produce in a given time by the space intended to be described by the circumference of the wheel in the same time: the quotient will be the resistance overcome at the circumference of the wheel, and is equal to the load required, including the friction and resistance of the machinery.

5. The greatest velocity that an overshot wheel is capable of, depends jointly upon the diameter or height of the wheel and the velocity of falling bodies; for it is plain that the velocity of the circumference can never be greater than to describe a semi-circumference, while a body let fall from the top describes the diameter, nor even quite so great; as the difference in point of time must always be in favour of that which falls through the diameter. Thus, supposing the diameter of the wheel to be 16 feet and an inch in diameter, an heavy body would fall through this space in one second; but such a wheel could never arrive at this velocity, or make one turn in two seconds, nor could an overshot wheel ever come near it; because, after it has acquired a certain velocity, great part of the water is prevented from entering the buckets, and part is thrown out again by the centrifugal force: and as these circumstances have a considerable dependence upon the form of the buckets, it is impossible to lay down any general rule for the velocity of this kind of wheels.

6. Though in theory we may suppose a wheel to be made capable of overcoming any resistance whatever, yet as in practice it is necessary to make the wheel and buckets of some certain and determinate size, we always find that the wheel will be stopped by such a weight as is equal to the effort of the water in all the buckets of a semi-circumference put together. This may be determined from the structure of the buckets themselves; but in practice, an overshot wheel becomes unserviceable long before this time; for when it meets with such an obstacle as diminishes its velocity to a certain degree, its motion becomes irregular; but this never happens till the velocity of the circumference is less than the two feet *per* second, when the resistance is equable.

7. From the above observations, we may easily deduce the force of water upon breast-wheels, &c. But in general, all kinds of wheels where the water cannot descend through a given space unless the wheel moves with it, are to be considered as overshot wheels; and those

Mills.

those which receive the impulse or shock of the water, whether in an horizontal, oblique, or perpendicular direction, are to be considered as undershots. Hence a wheel in which the water strikes at a certain point below the surface of the head, and after that descends in the arch of a circle, pressing by its gravity upon the wheel, the effect of such a wheel will be equal to that of an undershot whose head is equal to the difference of level between the surface of the water in the reservoir and the point where it strikes the wheel, added to that of an overshot, whose height is equal to the difference of level between the point where it strikes the wheel and the level of the tail-water.

66
Dispute concerning Sir Isaac Newton's doctrine of motion considered.

In the 66th volume of the Transactions, our author considers some of the causes which have produced disagreements and disputes among mathematicians upon this subject. He observes, that soon after Sir Isaac Newton had given his definition, "that the quantity of motion is the measure of the same, arising from the velocity and quantity of matter conjointly," it was controverted by his cotemporary philosophers. They maintained, that the measure of the quantity of motion should be estimated by taking the quantity of matter and the square of the velocity conjointly. On this subject he remarks, that from equal impelling powers acting for equal intervals of time, equal augmentations of velocity are acquired by given bodies when they are not resisted by a medium. Thus a body descending one second by the force of gravity, passes through a space of 16 feet and an inch; but at the end of that time it has acquired a velocity of 32 feet 2 inches in a second; at the end of two seconds, it has acquired one that would carry it through 64 feet 4 inches in a second. If, therefore, in consequence of this equal increase of velocity, we define this to be a double quantity of motion generated in a given time in a certain quantity of matter, we come near to Sir Isaac's definition: but in trying experiments upon the effects of bodies, it appears, that when a body is put in motion by whatever cause, the impression it will make upon an uniformly resisting medium, or upon uniformly yielding substances, will be as the mass of matter of the moving body multiplied by the square of its velocity. The question therefore properly is, whether those terms, the *quantity of motion*, the *momenta*, or *forces* of bodies in motion, are to be esteemed equal, double, or triple, when they have been generated by an equable impulse acting for an equal, double, or triple time? or that it should be measured by the effects being equal, double, or triple, in overcoming resistances before a body in motion can be stopped? For according to the meaning we put upon these words, the momenta of equal bodies will be as the velocities or squares of the velocities of the moving bodies.

Though by a proper attention to the terms employed, however, we will find both these doctrines to be true; it is certain that some of the most celebrated writers upon mechanics have fallen into errors by neglecting to attend to the meaning of the terms they make use of. Desaguliers, for instance, after having been at pains to show that the dispute, which in his time had subsisted for 50 years, was a dispute merely about words, tells us, that both opinions may be easily reconciled in the following case, viz. that the

wheel of an undershot water-mill is capable of doing quadruple work when the velocity of the water is doubled, instead of double work only: "For (says he) the adjutage being the same, we find, that as the water's velocity is double, there are twice the number of particles that issue out, and therefore the ladle-board is struck by twice the matter; which matter moving with twice the velocity that it had in the first case, the whole effect must be quadruple, though the instantaneous stroke of each particle is increased only in a simple proportion of the velocity." In another place, the same author tells us, that though "the knowledge of the foregoing particulars is absolutely necessary for setting an undershot wheel to work, yet the advantage to be reaped from it would be still guess-work; and we should be at a loss to find out the utmost that it could perform, had it not been for an ingenious proposition of that excellent mechanic M. Parent of the Royal Academy of Sciences, who has showed, that an undershot wheel can do the most work when its velocity is equal to the third part of that of the water; because then two-thirds of the water is employed in driving the wheel, with a force proportionable to the square of the velocity. By multiplying the surface of the adjutage or opening by the height of the water, we shall have the column of water that moves the wheel. The wheel thus moved will sustain on the opposite side only four-ninths of that weight which will keep it in equilibrio; but what it can move with the velocity it has, is only one-third of the equilibrium." This conclusion is likewise adopted by Mr Maclaurin.

Undershot wheels had been greatly preferred by M. Belidor to those of any other construction. He had even concluded, that water applied in this way will do more than six times the work of an overshot wheel; while Dr Desaguliers, in overthrowing Belidor's proposition, determined that an overshot wheel would do 10 times the work of an undershot wheel with an equal quantity of water. Between these two celebrated authors, therefore, there is a difference of no less than 60 to 1.

In consequence of such monstrous disagreement, Mr Smeaton began the experiments of which we have already given an account. From them, besides the positions already deduced, it appears, that where the velocity of water is double, the adjutage or aperture of the sluice remaining the same, the effect is eight times; that is, not as the square, but as the cube of the velocity. In the other conclusion of Desaguliers and Maclaurin, the error was no less; for from thence it would follow, that by means of the wheel only $\frac{1}{27}$ th of the water expended would be raised back again to the height of the reservoir from which it descended, exclusive of the friction, which would still diminish the quantity: but from Mr Smeaton's experiments it appears, that in some cases upwards of one-fourth had been raised. In large works the effects had been still greater, approaching in an undershot wheel to one half, and in an overshot one to the whole; which would be the limit, if it were possible, to remove the friction and resistance of the air. The velocity of the wheel also, which, according to the conclusions of M. Parent and Dr Desaguliers, amounted to no more than one-third of the velocity of the water,

Mills.

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Enormous mistakes of Belidor and others.

Mills. ter, varies, according to Mr Smeaton, between one-third and one-half. But in all great works the maximum lieth much nearer to one-half than a third; the former appearing to be the true maximum, if all friction, resistance of the air, and scattering of water, could be avoided.

To make these matters plain to mechanics, and to prevent them from running into practical errors in consequence of a fallacious theory, Mr Smeaton, in the year 1759, instituted another set of experiments; the immediate object of which was, to determine what proportion or quantity of mechanical power is expended in giving the same body different degrees of velocity. Having constructed a proper apparatus for the purpose, and with it made a number of experiments, he concludes, "that time, properly speaking, has nothing to do with the production of mechanical effects otherwise than as by equally flowing it becomes a common measure; so that whatever mechanical effect is found to be produced in a given time, the uniform continuance of the action of the same mechanical power will, in a double time, produce twice that effect. A mechanical power, therefore, properly speaking, is measured by the whole of its mechanical effects produced, whether that effect be produced in a greater or lesser time: thus, having treasured up 1000 tons of water, which I can let out upon the overshot wheel of a mill, and descending through a perpendicular of 20 feet; this power, applied in a proper manner, will grind a certain quantity of corn in an hour: but supposing the mill to be capable of receiving a greater impulse with as great advantage as a lesser; then, if the corn be let out twice as fast, the same quantity of water will be ground in half an hour, the whole of the water being likewise expended in that time. What time has therefore to do in the case is this: let the rate of doing the business or producing the effect be what it will; if this rate is uniform, when I have found by experiment what is done in a given time, then, proceeding at the same rate, twice the effect will be produced in twice the time, on supposition that I have a supply of mechanic power to go on with. Thus, 1000 tons of water descending through 20 feet perpendicular, being, as has been shown, a given mechanic power, let it be expended at what rate it will; if, when this is expended, we are to wait another hour till an equal quantity can be procured, then we can only expend 12 such quantities in 24 hours. But if, while the thousand tons of water are expending in one hour, the same quantity is renewed, we can then expend 24 such in the 24 hours, or go on without intermission. The product or effect will then be in pro-

portion to time, which is the common measure; but the quantity of mechanic power arising from the flow of the two rivers, compared by taking an equal portion of time, is double in the one to the other; though each has a mill that, when going, will grind an equal quantity of corn in an hour."

Mr Ferguson, in his directions to mill-wrights, has adopted the maxim which Mr Smeaton condemns as erroneous, viz. that when the velocity of the wheel is but one-third of that of the water, it then acts to the greatest advantage. He adds, that the millstone ought to make about 60 turns in a minute; for when it makes only 40 or 50 turns it grinds too slowly; and when more than 70, it heats the meal too much, and cuts the bran so small, that a part of it mixes with the meal and cannot be separated from it by any means. The utmost perfection of mill-work, therefore, according to this author, lies in making the train so that the mill-stone shall make about 60 turns in a minute, when the wheel moves with one-third of the velocity of the water. To accomplish this he lays down the following rules. 1. Measure the perpendicular height of the fall of water above the middle of the aperture, where it is let out to act by impulse against the float-boards on the lower side of the undershot wheel. 2. Multiply this constant number 64.2882 by the height of the fall in feet, and extract the square-root of the product, which will give the number of feet that the water moves in a second. 3. The velocity of the floats of the wheel is equal to one-third of the velocity of the water just now found. 4. Divide the circumference of the wheel by the velocity of its floats, and the quotient will be the number of seconds in one turn of the great water-wheel, on whose axis the cog-wheel that turns the trundle is fixed. 5. Divide 60 by the number of seconds in a turn of the water-wheel, and the quotient will be the number of turns it makes in a minute. 6. By this number of turns divide 60, the number of times that a mill-stone ought to have in a minute; the quotient is the number of turns that the mill-stone ought to make for every one of the large wheel. 7. Then as the number of turns required of the mill-stone in a minute is to the number of turns of the cog-wheel in a minute; so must the number of cogs in the wheel be to the number of flaves in the trundle on the axis of the mill-stone, in the nearest whole number that can be found.

On these principles Mr Ferguson has constructed the following table, for the sake of such as have occasion to construct mills, and are not willing to take the trouble of particular calculations.

The Mill-wright's TABLE.

Height of the fall of water.	Velocity of the fall of water per second.	Velocity of the wheel per second.	Revolutions of the wheel per minute.	Revolution of the millstone for one of the wheel	Cogs in the wheel, and staves in the trundle.	Revolutions of the millstone per minute by these staves and cogs.
Fect.	100 parts of a foot.	100 parts of a foot.	100 parts of a rev.	100 parts of a rev.	Cogs. Staves.	100 parts of a rev.
1	8 02	2 67	2 83	42 40	254 6	119 84
2	11 34	3 78	4 00	30 00	210 7	120 00
3	13 89	4 63	4 91	24 44	196 8	120 28
4	16 04	5 35	5 67	21 16	190 9	119 74
5	17 93	5 98	6 34	18 92	170 9	119 68
6	19 64	6 55	6 94	17 28	156 9	120 20
7	21 21	7 07	7 50	16 00	144 9	120 00
8	22 68	7 56	8 02	14 96	134 9	119 34
9	24 05	8 02	8 51	14 10	140 10	119 14
10	25 35	8 45	8 97	13 38	134 10	120 18
11	26 59	8 86	9 40	12 76	128 10	120 32
12	27 77	9 26	9 82	12 22	122 10	119 80
13	28 91	9 64	10 22	11 74	118 10	120 36
14	30 00	10 00	10 60	11 32	112 10	118 72
15	31 05	10 35	10 99	10 92	110 10	120 96
16	32 07	10 09	11 34	10 58	106 10	120 20
17	33 06	11 02	11 70	10 26	102 10	119 34
18	34 02	11 34	12 02	9 98	100 10	120 20
19	34 95	11 65	12 37	9 70	98 10	121 22
20	35 86	11 95	12 68	9 46	94 10	119 18
1	2	3	4	5	6	7

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Imison's
practical
rules for
the con-
struction
of mills.

For the practical construction of water-mills, Mr Imison hath laid down the following rules.

1. To find the velocity or force of any moderate stream of water; let it be obstructed by a dam in such a manner as to force the whole stream into a spout by which it may be conveyed into a large vessel or reservoir. Measure then the quantity of water which falls into the reservoir in one second or minute; and multiplying by the number of seconds or minutes in an hour, we have the whole force of the stream of water *per* hour. In streams which are too large to be measured in this way, the velocity is determined (though we must own in a vague manner) by that of straw or other light body floating down it; and calculations may be made accordingly.

Mr Imison differs very materially from Mr Ferguson in the number of revolutions which a mill-stone ought to make in a minute; the latter, as has been already mentioned, being of opinion, that 60 revolutions of a mill-stone in a minute are sufficient, while Mr Imison requires 120; though he agrees with him that the velocity of the wheel should be only one-third of that of the water. The mill-stone, according to Mr N^o 200.

Ferguson, ought to be five feet in diameter; but Mr Imison makes it only four feet and an half.

To construct a mill by this table, find the height of the fall of water in the first column, and against that height in the sixth column you have the number of cogs in the wheel and staves in the trundle for causing the millstone 4 feet 6 inches diameter to make about 120 revolutions in a minute, as near as possible, when the wheel goes with one-third part of the velocity of the water. And it appears by the 7th column, that the number of cogs in the wheel and staves in the trundle are so near the truth for the required purpose, that the least number of revolutions of the mill-stone in a minute is 118, and the greatest number never exceeds 121; which, according to our author, is the velocity of the best mills he had seen.

With regard to the mere mechanical part, our author observes, that an overshot wheel acts with greater power than a breast or undershot wheel; so that where there is a considerable descent, and only a small quantity of water, the overshot wheel ought always to be made use of. Where the water runs only upon a little declivity, it can act but slowly upon the under part of the

Mills. the wheel; in which case, the motion of the wheel will be very slow: the float-boards therefore ought to be very long, though not high, that a large body of water may act upon them; so that what is wanting in velocity may be made up in power: in which case, the cog wheel may have a greater number of cogs in proportion to the staves of the trundle, in order to give the mill-stone a sufficient degree of velocity.

For the construction of the different parts of mills, Mr Imison gives the following general directions:

The method for setting out a spur-wheel and wallower.
—Draw the pitch lines $A_1, B_1, A_2, 2B$; then divide them into the number of teeth or cogs required, as abc .

Fig. 96.

Divide one of those distances, as bc , into seven equal parts, as 1, 2, 3, 4, 5, 6, 7: three parts allow for the thickness of the cogs, as 1, 2, 3, in the cog a , and four for the thickness of the flave, of the wallower (one reason for allowing three parts for the cog and four for the flave, is, the wallower is in general of less diameter than the wheel, therefore subject to more wear in proportion of the number of cogs to the number of flaves; but if there is the same number of flaves as of cogs, they may be of equal thickness), as 1, 2, 3, 4, in the flave m , fig. 97. the height of the cog is equal to four parts; then divide its height into five equal parts, as 1, 2, 3, 4, 5, in the cog C ; allow three for the bottom to the pitch line of the cog; the other two parts for epicycloid, so as to fit and bear on the flave equally. The mill-wrights in general put the point of a pair of compasses in the dot 3, of the cog a , and strike the line de ; then remove the point of the compasses to the point d , and strike the curve line $3f$, which they account near enough the figure of the epicycloid.

The method for a face-wheel is thus: Divide the pitch line AB into the number of cogs intended, as abc ; divide the distance bc into seven equal parts; three of those parts allow for the thickness of the cogs, as 1, 2, 3, in the cog a , four for the height and four for the width, as de , and four for the thickness of the flave m ; draw a line through the centre of the cog, as the line AI at S ; and on the point 5 describe the line de ; remove the compasses to the point A , and draw the line fg , which forms the shape of the cog; then shape the cog on the sides to a cycloid, as $defg$. But this method of setting out the shape of a cog is variable, according to the cycloid in different diameters of wheels.

In common spur-nuts, divide the pitch line A into twice as many equal parts as you intend teeth, as a, b, c, d, e , fig. 98.; with a pair of compasses opened to half the distance of any of those divisions, from the points a_1, c_3, e_5 , draw the semicircles a, c , and e , which will form the ends of the teeth. From the points 2, 4, and 6, draw the semicircles ghi , which will form the hollow curves for the spaces; but if the ends of the teeth were epicycloids, instead of semicircles, they would act much better.

Fig. 99.

The principle of bevel gear,—consists in two cones, rolling on the surface of each other, as the cone A and B revolving on their centres ab, ac ; if their bases are equal, they will perform their revolutions in one and the same time, or any other two points equally distant from the centre a , as d_1, d_2, d_3 , &c. will revolve in

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the same time as f_1, f_2, f_3 , &c. In the like manner, if the cones $afde$ be twice the diameters at the base de , as the cones afe are; then if they turn about their centres, when the cone afd has made one revolution, the cone ade will have made but half a revolution; or when afd has made two revolutions, ade will have made but one, and every part equally distant from the centre a , as f_1, f_2, f_3 , &c. will have made two revolutions to e_1, e_2, e_3 , &c. and if the cones were fluted, or had teeth cut in them, diverging from the centre a to the bases de, ef , they would then become bevel gear. The teeth at the point of the cone being small and of little use, may be cut off at E and F , figs. 102, 103. as seen by fig. 104. where the upright shaft ab , with the bevel wheel cd , turns the bevel wheel ef with its shaft bg , and the teeth work freely into each other, as ab , fig. 105. The teeth may be made of any dimension, according to the strength required; and this method will enable them to overcome a much greater resistance, and work smoother than a face wheel and wallower of the common form can possibly do; besides, it is of great use to convey a motion in any direction, or to any part of a building, with the least trouble and friction.

The method of conveying motion in any direction, and proportioning or shaping the wheels thereto, is as follows: let the line ab represent a shaft coming from a wheel; draw the line ed to intersect the line ab , in the direction that the motion to be conveyed is intended, which will now represent a shaft to the intended motion.

Fig. 106.

Again, suppose the shaft ed is to revolve three times, whilst the shaft ab revolves once, draw the parallel line ii , at any distance not too great, suppose one foot by a scale; then draw the parallel line kk at three feet distance, after which draw the dotted line wX , through the intersection of the shafts ab and ed , and likewise through the intersection of the parallel lines ii and kk , in the points X and y ; which will be the pitch line of the two bevel wheels, or the line where the teeth of the two wheels act on each other, as may be seen fig. 107. where the motion may be conveyed in any direction.

The universal joint, as represented fig. 108. may be applied to communicate motion instead of bevel gear, where the speed is to be continued the same, and where the angle does not exceed 30 or 40 degrees, and the equality of motion is not regarded; for as it recedes from a right line, its motion becomes more irregular. This joint may be constructed by a cross, as represented in the figure; or with four pins fastened at right angles upon the circumference of a hoop or solid ball. It is of great use in cotton-mills, where the tumbling shafts are continued to a great distance from the moving power. But by applying this joint, the shafts may be cut into convenient lengths, by which it will be enabled to overcome greater resistance.

To describe the cycloid and epicycloid, of use in shaping the teeth of wheels, &c.—If a point or pencil a on the circumference of the circle B proceeds along the plane aC in a right line, and at the same time revolves round its centre, it will describe a cycloid.

Fig. 109.

And if the generating circle D moves along the circumference of another circle E , and at the same time turns round its centre, the point of contact will describe an epicycloid.

Fig. 110.

5 E

In

Mills.
Plates
CCLXXXIX,
CCXC.
fig. 100,
101.

Plate
CCXC.

In the construction of wind-mills, Mr Smeaton has been at no less pains to explain the principles than in those which go by water. For this purpose he constructed a machine, of which a particular description is given in the 51st volume of the Philosophical Transactions. The general principle of this was, that by means of a determinate weight it carried round an axis with an horizontal arm, upon which were four small moveable sails. Thus the sails met with a constant and equable blast of air; and as they moved round, a string with a weight affixed to it was wound about their axis, and thus showed what kind of size or construction of sails answered the purpose best.

With this machine a great number of experiments were made; the results of which were as follow.

1. The sails set at the angle with the axis, proposed as the best by M. Parent and other geometricians, viz. 55° , was found to be the worst proportion of any that was tried.

2. When the angle of the sails with the axis was increased from 72° to 75° , the power was augmented in the proportion of 31 to 45; and this is the angle most commonly in use when the sails are planes.

3. Were nothing more requisite than to cause the sails acquire a certain degree of velocity by the wind, the position recommended by M. Parent would be the best. But if the sails are intended with given dimensions, to produce the greatest effects possible in a given time, we must, if planes are made use of, confine our angle within the limits of 72 and 75 degrees.

4. The variation of a degree or two, when the angle is near the best, is but of little consequence.

5. When the wind falls upon concave sails, it is an advantage to the power of the whole, though each part separately taken should not be disposed of to the best advantage.

6. From several experiments on a large scale, Mr Smeaton has found the following angles to answer as well as any. The radius is supposed to be divided into six parts; and $\frac{1}{6}$ th, reckoning from the centre, is called 1, the extremity being denoted 6.

No	Angle with that axis.	Angle with the plane of motion.
1	72°	18°
2	71	19
3	72	18 middle
4	74	16
5	$77\frac{1}{2}$	$22\frac{1}{2}$
6	83	7 extremity.

7. Having thus obtained the best method of *weathering* the sails, i. e. the most advantageous manner in which they can be placed, our author's next care was to try what advantage could be derived from an increase of surface upon the same radius. The result was, that a broader sail requires a large angle; and when the sail is broader at the extremity than near the centre, the figure is more advantageous than that of a parallelogram. The figure and proportion of enlarged sails, which our author determines to be most advantageous on a large scale, is, that where the extreme bar is one-third of the radius or whip (as the workmen call it), and is divided by the whip in the proportion of 3 to 5. The triangular or loading sail is covered with board from the point downward of its

height, the rest as usual with cloth. The angles above mentioned are likewise the most proper for enlarged sails; it being found in practice, that the sails should rather be too little than too much exposed to the direct action of the wind.

Some have imagined, that the more sail the greater would be the power of the windmill, and have therefore proposed to fill up the whole area; and by making each sail a sector of an ellipsis, according to M. Parent's method, to intercept the whole cylinder of wind, in order to produce the greatest effect possible. From our author's experiments, however, it appeared, that when the surface of all the sails exceeded seven-eighths of the area, the effect was rather diminished than augmented. Hence he concludes, that when the whole cylinder of wind is intercepted, it cannot then produce the greatest effect for want of proper interstices to escape.

"It is certainly desirable (says Mr Smeaton), that the sails of windmills should be as short as possible; but it is equally desirable, that the quantity of cloth should be the least that may be, to avoid damage by sudden squalls of wind. The best structure, therefore, for large mills, is that where the quantity of cloth is the greatest in a given circle that can be: on this condition, that the effect holds out in proportion to the quantity of cloth; for otherwise the effect can be augmented in a given degree by a lesser increase of cloth upon a larger radius, than would be required if the cloth was increased upon the same radius.

8. The ratios between the velocities of windmill sails unloaded, and when loaded to their maximum, turned out very different in different experiments, but the most common proportion was as 3 to 2. In general it happened, that where the power was greatest, whether by an enlargement of the surface of the sails, or an increased velocity of the wind, the second term of the ratio was diminished.

9. The ratios between the least load that would stop the sails and the maximum with which they would turn, were confined betwixt that of 10 to 8 and 10 to 9; being at a medium about 10 to 8.3, and 10 to 9, or about 6 to 5; though on the whole it appeared, that where the angle of the sails or quantity of cloth was greatest, the second term of the ratio was less.

10. The velocity of windmill sails, whether unloaded or loaded, so as to produce a maximum, is nearly as the velocity of the wind, their shape and position being the same. On this subject Mr Ferguson remarks, that it is almost incredible to think with what velocity the tips of the sails move when acted upon by a moderate wind. He has several times counted the number of revolutions made by the sails in 10 or 15 minutes; and from the length of the arms from tip to tip, has computed, that if an hoop of the same size was to run upon plain ground with an equal velocity, it would go upwards of 30 miles in an hour.

11. The load at the maximum is nearly, but somewhat less, than as the square of the velocity of the wind; the shape and position of the sails being the same.

12. The effects of the same sails at a maximum are nearly, but somewhat less, than as the cubes of the velocity of the wind.

13. The load of the same sails at a maximum is nearly

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nearly as the squares, and the effect as the cubes of their number of turns in a given time.

14. When sails are loaded so as to produce a maximum at a given velocity, and the velocity of the wind increases, the load continuing the same; then the increase of effect, when the increase of the velocity of the wind is small, will be nearly as the squares of these velocities; but when the velocity of the wind is double, the effects will be nearly as 10 to 27 $\frac{1}{2}$; and when the velocities compared are more than double of that where the given load produces a maximum, the effects increase nearly in a simple ratio of the velocity of the wind. Hence our author concludes, that windmills, such as the different species for draining water, &c. lose much of their effect by acting against one invariable opposition.

15. In sails of a similar figure and position, the number of turns in a given time will be reciprocally as the radius or length of the sail.

16. The load at a maximum that sails of a similar figure and position will overcome, at a given distance from the centre of motion, will be as the cube of the radius.

17. The effects of sails of similar position and figure are as the square of the radius. Hence augmenting the length of the sail without augmenting the quantity of cloth, does not increase the power; because what is gained by the length of the lever is lost by the slowness of the motion. Hence also if the sails are increased in length, the breadth remaining the same, the effect will be as the radius.

18. The velocity of the extremities of the Dutch sails, as well as of the enlarged sails, either unloaded or even when loaded to a maximum, is considerably greater than that of the wind itself. This appears plainly from the observations of Mr Ferguson already related concerning the velocity of sails, and is more fully treated of under the article WIND.

19. From many observations of the comparative effects of sails of various kinds, Mr Smeaton concludes, that the enlarged sails are superior to those of the Dutch construction.

Having thus discussed the subject of the common windmills with oblique vanes, our author next proceeds to the consideration of those called *horizontal* windmills, in which it is attempted to make the wind impinge directly upon the wheel, as in the case of watermills. To set the probable advantage of this scheme in its proper point of view, Mr Smeaton proceeds in the following manner: "Let AB, fig. 111. be the section of a plane, in which let the wind blow in the direction CD, with such a velocity as to describe a given space BE, in a given time, suppose one second; and let AB be moved parallel to itself in the direction CD. Now, if the plane AB moves with the same velocity as the wind; that is, if the point B moves through the space BE in the same time that a particle of air would move through it, it is plain, that in this case there can be no pressure or impulse of the wind upon the plane; but if the plane moves slower than the wind, so that the point B may move to F, while a particle of air setting out from B would reach E, then BF will express the velocity of the plane; and the relative velocity of the wind and plane would be expressed by the line FE. Let the ratio of FE to BE be

given, suppose 2 to 3; let the line AB represent the impulse of the wind upon the plane AB when acting with its whole velocity BE; but when acting with its relative velocity FE, let its impulse be denoted by some aliquot part of AB, as for instance $\frac{2}{3}$; then will $\frac{2}{3}$ ths of the parallelogram AF represent the mechanical power of the plane, that is, $\frac{2}{3}$ ths AB $\times$ $\frac{1}{3}$ BE.

"2. Let IN be the section of a plane inclined in such a manner, that the base IK of the right angled triangle IKN may be equal to AB; and the perpendicular NK = BE: let the plane IN be struck by the wind in the direction LM, perpendicular to IK; then, according to the known rules of oblique forces, the impulse of the wind upon the plain IN, tending to move it according to the direction LM or NK, will be denoted by the base IK; and that part of the impulse tending to move it, according to the direction IK, will be expressed by the perpendicular NK. Let the plane IN be moveable in the direction of IK only; that is, the point I in the direction of IK, and the point N in the direction NQ parallel thereto. Now it is evident, that if the point I moves through the line IK, while a particle of air, setting forwards at the same time from the point N, moves through the line NK, they will both arrive at the point K at the same time; and consequently there can be no pressure or impulse of the particle of air upon the plane IN. Now let IO be to IK as BF to BE; and let the plane IN move at such a rate, that the point I may arrive at O, and acquire the position OQ, in the same time that a particle of air would move through the space NK; as OQ is parallel to IN, by the properties of similar triangles, it will cut NK in the point P in such a manner, that NP will be equal to BF, and PK to FE. Hence it appears, that the plane IN, by acquiring the position OQ, withdraws itself from the action of the wind, by the same space NP that the plane AB does by acquiring the position FG; and consequently, from the equality of PK to FE, the relative impulse of the wind PK upon the plane OQ will be equal to the relative impulse of the wind upon the plane FG: and since the impulse of the wind upon AB, with the relative velocity FE, in the direction BE, is represented by $\frac{2}{3}$ AB; the relative impulse of the wind upon the plane IN in the direction NK will in like manner be represented by $\frac{2}{3}$ IK; and the impulse of the wind upon the plane IN, with the relative velocity PK, in the direction IK will be represented by $\frac{2}{3}$ NK: and consequently the mechanical power of the plane IN in the direction IK will be represented by $\frac{2}{3}$ of the parallelogram IQ; that is, $\frac{2}{3}$ IK $\times$ $\frac{1}{3}$ NK; that is, from the equality of IK to AB, and NK to BE, we shall have $\frac{2}{3}$ IQ = $\frac{2}{3}$ AB $\times$ $\frac{1}{3}$ BE = $\frac{2}{9}$ AB $\times$ $\frac{1}{3}$ BE = $\frac{2}{9}$ the area of the parallelogram AF.

"Hence we deduce this general proposition; that all planes, however situated, that intercept the same section of the wind, and having the same relative velocity in regard to the wind, when reduced into the same direction, have equal powers to produce the same mechanical effects. For what is lost by the obliquity of the impulse, is gained by the velocity of the motion.

"Hence it appears, that an oblique sail is under no disadvantage in respect of power, compared with a direct one; except what arises from a diminution of its

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breadth, in regard to the section of the wind; the breadth IN being by obliquity reduced to IK.

"The disadvantage of horizontal windmills therefore does not consist in this, that each sail, when directly exposed to the wind, is capable of a less power than an oblique one of the same dimensions; but that in an horizontal windmill little more than one sail can be acting at once: whereas, in the common windmill, all the four act together; and therefore, supposing each vane of an horizontal windmill to be of the same size with that of a vertical one, it is manifest that the power of a vertical mill will be four times as great as that of an horizontal one, let the number of vanes be what we will. This disadvantage arises from the nature of the thing; but if we consider the further disadvantage that arises from the difficulty of getting the sails back again against the winds, &c. we need not wonder if this kind of mill is in reality found to have not above one-eighth or one-tenth of the power of the common sort; as has appeared in some attempts of this kind."

Notwithstanding what is here advanced, it seems that the ideas of Mr Smeaton have not been very generally received, as premiums are still held forth for the best methods of constructing horizontal wind-mills. Indeed, considering the clearness and perspicuity of the above reasoning, it seems surprising that public encouragement should continue to be given to attempts which must certainly prove abortive. The principal inconvenience in wind-mills is their excessive irregularity and difficulty of being managed when the wind is high, owing to the great extent of the sails and bulk of the machinery. But were it possible to make a number of small wind-mills exert their power upon one object, these would be much more easily managed than one large one. Perhaps if a number of these were to be employed in pumping up water to a certain height from a lake or reservoir, so as to produce a constant stream of water to turn a common mill, it might be more advantageous than to employ them directly. Wind-mills are commonly erected upon eminences for the sake of receiving the wind to more advantage; and there are few eminences which do not afford a small supply of water at no great distance from their summit. This supply being collected in a reservoir, might be drawn up to the top by pumps worked by wind-mills; where being collected in another reservoir, it might be let down to the former, turning a water-mill in its way, and being again drawn up by the pumps as before.

Some projectors, considering the great power of oblique vanes in wind-mills, have attempted to improve water-mills by giving them oblique vanes, but with as little success. The power of the same section of a stream of water is not greater when acting upon an oblique vane than on a direct one; and any advantage which can be made of intercepting a greater section of water, which sometimes may be done in the case of an open river, must be counterbalanced by the superior resistance that such vanes would meet with by moving at right angles to the current: whereas the common floats always move with the water nearly in the same direction.

Mr Smeaton concludes his dissertation upon this subject, with giving a reason why one angle should be

preferable to another in setting the sails of a wind-mill. Motion of Bodies.
"It is to be observed (says he), that if the breadth of the sail IN is given, the greater the angle KIN, the less will be the base IK; that is, the section of the wind intercepted will be less. On the other hand, the more acute the angle KIN, the less will be the perpendicular KN; that is, the impulse of the wind in the direction IK being less, and the velocity of the sail greater, the resistance of the medium will be greater also. Hence, therefore, as there is a diminution of the section of the wind intercepted on one hand, and an increase of resistance on the other, there is some angle where the disadvantage arising from these causes upon the whole is the least of all; but as the disadvantage arising from resistance is more of a physical than geometrical consideration, the true angle will best be assigned by experiment."

SECT. VI. *Of the Motion of Bodies in Straight Lines and Curves; the Acceleration, Accumulation, and Retardation, of Motion in various Circumstances.*

To understand this subject, it is necessary to keep in mind what has been said concerning the *momentum* or quantity of motion in any moving body, viz. that it is compounded of the velocity multiplied into the quantity of matter. Thus, suppose there are two bodies, one containing twice the quantity of matter contained in the other, but moving with thrice its velocity, the quantities of matter will be expressed by any numbers in the proportion of 2 to 1, and their velocities by any others in the proportion of 3 to 1. Multiplying therefore the quantity of matter in the first (2) by its velocity (3), the product is 6; and multiplying the quantity of matter (1) by its velocity (1), the product is only 1; whence it appears that the momenta or absolute forces of these bodies are to one another as 6 to 1.

As some bodies are elastic and others non-elastic, the effect of motion communicated from one to another becomes very different, according to this circumstance. The motion is likewise very different, according to the manner in which one body acts upon another, and according to which it will be driven forward in a rectilinear direction, or describe curves of various kinds, revolving on its axis, &c. These different kinds of motion have been considered by different authors, but by none more particularly than Mr G. Atwood, who has published a large octavo volume upon the rectilinear motion and rotation of bodies. The fundamental laws of motion assumed by this author as axioms are three.

1. Every body perseveres in its state of rest or uniform motion in a right line, until a change is effected by the agency of some external force.

2. Any change effected in the quiescence or motion of a body is in the direction of the force impressed, and is proportional to it in quantity.

3. Action and reaction are equal, and in contrary directions.

From these three simple axioms, the truth of which must, from what has been already said, be abundantly evident, our author proceeds to demonstrate the most difficult problems concerning the impulse and motion of

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of bodies in every possible direction, beginning from the most simple and easy deductions. For the more easy comprehending this subject, however, we shall premise what our author has said in his second section concerning the properties of *ratios* or proportions.

1. Two mathematical quantities of the same kind, as two lines, two surfaces, two angles, &c. constitute a ratio. Thus, suppose one line two feet in length and another four; these are to one another in the ratio of 4 to 2, or of 2 to 1; but a line cannot be said to bear any ratio to a surface, because they are not quantities of the same kind, and therefore cannot be compared.

2. We may compare the ratio of two quantities of one kind with the ratio of two quantities of a different kind. Thus, when two bodies move uniformly, for an equal time, but with different velocities, the ratio of the spaces passed over may be compared with that of the velocities, though space and velocity are accounted different quantities.

3. If any quantity be divided by another of the same kind, the quotient becomes absolute number. Thus, if we divide a velocity of four feet in a second by one of two feet in a second, the quotient will be 2; and in all cases the quotient will be to 1 as the greater quantity is to the lesser.

4. The ratio of any mathematical quantities may be expressed by two numbers, if both terms of the ratio be divided by the consequent or by the antecedent. Thus, let the antecedent be 8 and the consequent 4; let both be divided by 4, and the ratio will then be 2 to 1; or let both be divided by 8, and it will be 1 to 0.5, which is the same.

5. Any ratio may be represented by a fraction, the numerator of which is the antecedent, and the denominator the consequent. Thus the ratio of 8 to 4 is represented by the fraction $\frac{8}{4}$; and hence we may add and subtract ratios by the addition and multiplication of fractions. Thus, supposing two bodies to move uniformly, one at the rate of 8 feet in a second and the other 4; supposing them also to move the former for four, and the latter for two seconds, the spaces passed over will be 32 and 8, their ratio $\frac{32}{8}$, or at length $32:8::4\times8:2\times4$; or $\frac{1}{2} = \frac{4}{8} \times \frac{8}{4}$. Here it is to be observed, that when the mark of equality is interposed betwixt heterogeneous quantities, the only equality meant is that which subsists between the ratios there expressed; and when the mark of multiplication is interposed between heterogeneous quantities, it means the addition of two ratios, the antecedents of which are the terms expressed, and the consequents are unity.

6. If there are three ratios, consisting of variable terms, and the relation of the quantities to each other be such, that when the third ratio becomes unity the other two become equal; or when the second becomes unity, the first and third are equal; then in all cases, whatever be the magnitudes, we have the first ratio = the 2d $\times$ 3d. Thus let the three ratios be $\frac{4}{2}$, $\frac{2}{1}$, and $\frac{1}{2}$; diminishing the numbers by 1, we have $\frac{3}{1}$, $\frac{1}{1}$, and $\frac{1}{2}$; it is evident that $\frac{3}{1} = \frac{3}{1} \times \frac{1}{2}$: the same will be the case if we place them in a different order, as $\frac{2}{1}$, $\frac{4}{2}$, and $\frac{1}{2}$; for then, diminishing as before, we have $\frac{1}{1}$, $\frac{3}{1}$, and $\frac{1}{2}$, in which case $\frac{3}{1} = \frac{3}{1} \times \frac{1}{2}$.

7. In comparing the ratios which obtain between

mathematical quantities of any sort, the standard to which each of those quantities is referred may be taken = 1. Thus, supposing we compare the weight, magnitude, and density, of any substance with water, we may take a cubic inch of that element for a standard, and call the weight, magnitude, and density of it = 1; by which means we may readily compare the weight, magnitude, or density, of any quantity, however large, of another substance with water.

We now proceed to that part of the work which treats directly of the motion of bodies acted upon by any external impulse.

8. Any force acting continually upon a body in the same direction, will produce a continual acceleration or retardation of the motion. Thus, if a body descends by the force of gravity, its motion is continually accelerated; or if it be thrown up against the force of gravity, the motion will be continually retarded until it be totally destroyed.

9. If, while a body moves, equal quantities of motion be communicated to it, or taken from it in equal spaces of time, the force is said to be constant, and equally accelerated or retarded.

10. When unequal velocities are generated or destroyed in equal spaces of time, the force is said to be variable.

11. When a body is acted upon by a constant force, we must consider the space through which it moves, the time it takes to move through it, the velocity it acquires, and the force which produces it; any two of which being given, we may from them find the other two. Here we must observe, that the force mentioned relates only to the communication of the velocity, without any regard to the quantities of matter moved. As it is proportioned to the velocity generated in a given time, it is thence called the *accelerating* force. That which relates to the quantity of matter moved, as well as the velocity communicated, is called the *moving* force; being proportional to the quantity of motion produced in a given time.

12. The moving forces which communicate the same velocity in a given time to different bodies, will be as the quantities of matter contained in the bodies moved. This will appear from a consideration of what has already been said concerning the momenta of bodies. For if one body contains ten times the quantity of matter that another does, it will of course require ten times as much force to move it with an equal degree of velocity; for the former is equivalent to ten such bodies, and it is the same thing whether they be separate or altogether.

13. The moving forces which act upon bodies, and the degrees of velocity communicated to them in a certain time, are proportional to the quantities of matter moved and the velocities communicated jointly: for, by the last proposition, when the velocity communicated in a certain time is the same, the moving force is as the quantity of matter moved. Thus, if a ball of ten pounds weight is made to move at the rate of 10 feet in a second, and another of one pound is made to move at the same rate, the moving forces will be in proportion to the quantities of matter; that is, as 10 to 1. Hence we may easily perceive, that when the quantity of matter is given, the moving force will be as the velocity. Thus, if two balls of ten pounds each

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each are caused to move, one with the velocity of ten feet in a second, and the other with a velocity of five feet in the same time, the forces will be as the velocities; that is, as 10 to 5, or as 2 to 1; and hence, when both the quantities of matter and velocities are different, the moving forces will be according to these jointly. Thus if a ball of ten pounds is moved with a velocity of ten feet in a second, and a ball of one pound moves with a velocity of five feet in a second, the moving forces will be as 10×10 or 100 is to 1×5 , or as 20 to 1.

Here our author takes occasion to deny that there is any such thing as a communication of motion by an instantaneous impulse or stroke, as has commonly been supposed. Every degree of motion, according to him, is the effect of acceleration. "The latter way (says he) viz. the communication by instantaneous impulse, can obtain only in bodies perfectly hard and inflexible, which exist not in nature; and even in the abstract consideration of these as well as of other cases in mechanics, when metaphysical possibilities instead of the natural state of bodies are attended to, difficulties arise hardly explicable by any method of reasoning: but it is certain, that when finite velocity is communicated to any natural body, the time in which it is communicated must be finite also; so that when the body acted upon begins to move from quiescence, it must, during the action of the force, possess all the intermediate degrees of velocity between 0 and the velocity ultimately communicated.

"To exemplify this further, let it be supposed that a soft and flexible ball of clay impinges against another of the same sort, in the direction of a line joining the centres of the balls. At the first instant of the impact, the body struck will begin to move, and will proceed with a velocity inferior to that of the impinging body, the velocity of which will continue to decrease, and that of the other body to increase, as long as the impinging force causes a change in the figure of the two bodies; that is, till they have both acquired a common velocity; at which instant all acceleration ceases if the bodies be perfectly non-elastic. If the bodies be of such a kind, as, after having received impression from any impact, possess a power of restoring their changed figure with a force equal to that of the impact, it is manifest, that whatever velocity was communicated during the change of figure, an equal quantity will be superadded during the restoration of it. In this case, after the acceleration arising from the impact during the change of the figure of the bodies has ceased, the bodies having then acquired a common velocity, a new acceleration will begin, being caused by the elastic force of the balls, which, acting in a direction of the lines joining their centres, tends to separate them, accelerating the ball struck, and retarding the other.

"From these considerations it appears, that in whatever degree the hardness of perfectly elastic bodies may differ, the effects of their impact will be the same, the weights and velocities before the stroke being given. For the figures of the striking and of the other body continually change, till they have acquired a common velocity, which depends only on the velocity of bodies and their impact, and is determined by the rules for the collision of non-elastic bodies. Moreover, the restoration of the changed figures, how great

or how small soever may have been the change, must cause an addition of velocity in the ball struck equal to that received from the impact.

"It follows also, that the effect will be the same, whether the bodies be both perfectly elastic, or whether one of them be perfectly elastic and the other perfectly hard; every thing else being given for the figure of the elastic body must change until the bodies have obtained a common velocity, which depends on the weights and velocities before the stroke only; and will be the same as if the bodies were non-elastic: the restoration of the figure will in this, as well as in the former case, cause an increase of velocity in the ball struck, equal to that before communicated. Although no substance in nature possesses perfect elasticity, or is entirely destitute of it, yet there are several elastic and non-elastic bodies subject to experimental trials, wherein the laws relating to collision are found to agree with fact to a considerable degree of exactness."

14. The accelerating forces which communicate velocity to bodies are directly as the moving forces, and inversely as the quantity of matter moved; for since by prop. 11. the accelerating force is as the velocity generated in a given time; and by prop. 13. the moving force is as the quantity of matter and velocity generated in a given time, it follows, that the moving force is as the accelerating force and quantity of matter moved jointly: that is, the accelerating force is as the moving force directly, and the quantity of matter moved inversely. Thus, let a mass of matter, equal to four ounces, be impelled by a force equal to three ounces; then the force which accelerates the mass of four ounces will be three-fourths when the acceleration of gravity is 1; or in other words, it will generate, in a given time, three parts in four of the velocity which gravity generates during any given time.

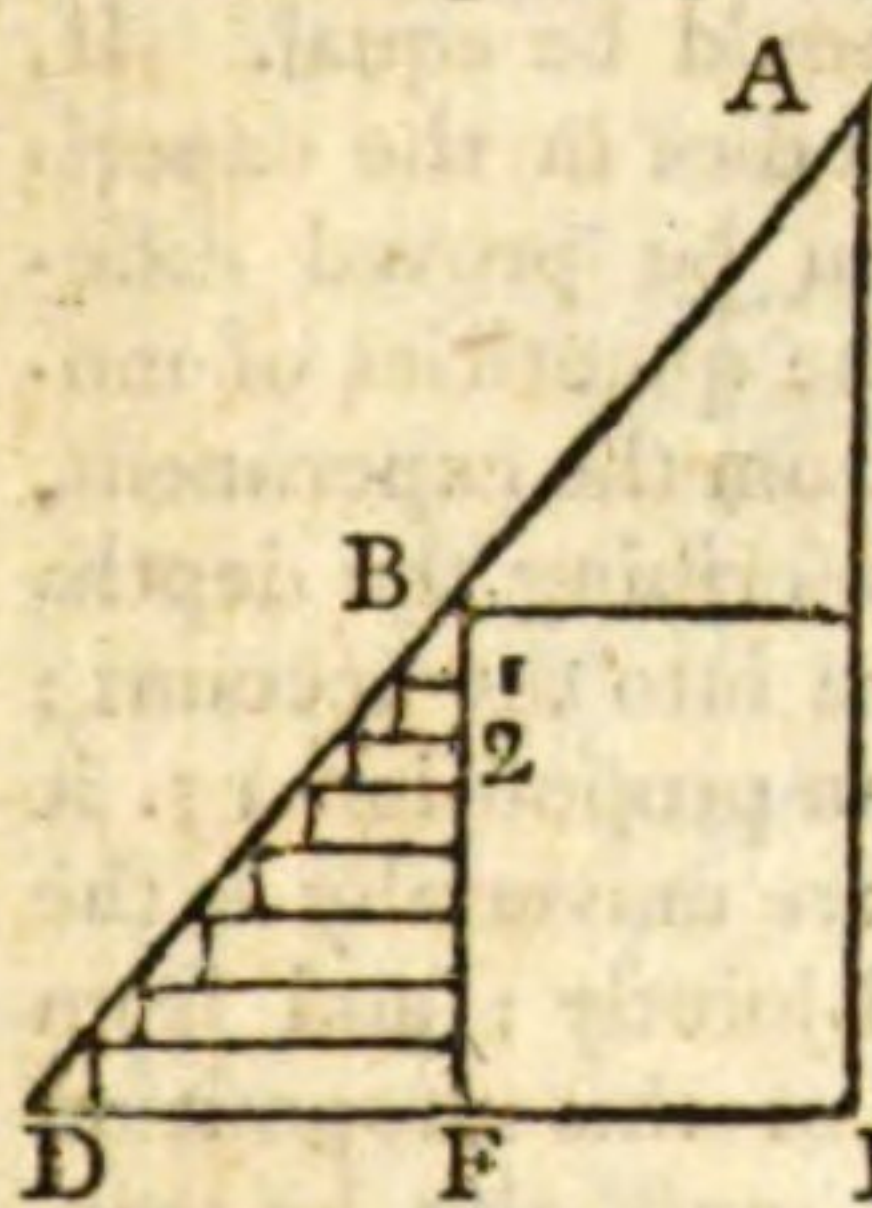
15. In bodies impelled in a rectilinear direction by forces acting uniformly, the velocities generated are as the forces and times in which they act, conjointly. Thus, suppose a force equal to ten acting upon a ball of ten pounds, and another also equal to ten acting upon a ball of equal weight, the former for one second, and the latter for two; it is plain that the velocity generated in the latter will be double to that generated in the former. But if we suppose the latter ball to be acted upon by a force equal only to five, then will both the velocities be equal, though the latter should continue for two seconds and the former only for one. In all practical inquiries of this kind, however, it must be remarked, that a standard velocity is to be obtained from observing what degree of velocity is generated by the force of gravity during a given time; one second, for instance.

16. If a quiescent body be impelled by any constant force acting upon it for a given time, the space described will be to the space described in the same time by a body moving uniformly with the last acquired velocity, in the ratio of one to two. In order to understand this, we must suppose the time to be divided into such small parts that the acceleration during any one of them is imperceptible: then it is evident, that at the end of two moments, the impulse continuing the same, it will have gained double the velocity it did the first moment; and this

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Motion of Bodies. is manifest from the phenomena of falling bodies, which having descended for one second, acquire then a velocity twice as great as that which they had during the first second. That this proposition may be true, however, it is necessary that the velocity of the impelling power should be *infinite* with respect to that which the body itself can acquire; for whenever the body moved comes to acquire a velocity in any degree proportional to that of the moving power, then that proportion must be deducted from the acceleration; and when both come to be equal, no farther acceleration can take place. With regard to falling bodies, indeed, as far as our observations can go, were it not for the resistance of the air, this acceleration would go forward till the body had acquired a velocity much superior to any that we can now communicate, either by that or any other method. In all artificial accelerations, however, the velocity of the body moved soon becomes equal to that of the moving power, and then the motion goes on uniformly, which otherwise would continually increase.

17. The spaces which bodies describe from rest, by the action of constant forces, are in a compound ratio of the velocities last acquired and the times of motion: For the spaces described by the last acquired velocities continued uniform, are as those velocities, and the times of motion jointly; and the spaces described by the accelerating forces acting constantly for equal respective times, are half the former spaces by prop. 16. This will perhaps appear more intelligible from the



annexed figure; in which the motion of a body, by an accelerated force, is represented by a triangle; for supposing the body to begin its motion from the point A, and to be uniformly accelerated until it arrived at the point C, it is plain that the velocity acquired would then be properly represented by the triangle ABC; but if the acceleration was then to cease, the velocity, and consequently the space passed over, would be represented by the parallelogram BCFE, double the triangle ABC. But let us suppose the acceleration still to go on, as is represented in the triangle BDF; it is plain that the space passed over in every small moment of time will be composed of a parallelogram formed by the velocity last acquired, and a triangle formed by the acceleration during that moment, which is entirely in terms of the proposition, that the spaces are in a compound ratio of the velocities last acquired, and the times of motion.

18. Constant forces which accelerate bodies, cause them to describe, from rest, spaces which are as the forces and squares of the times wherein they act jointly. For the spaces described are as the velocities last acquired, and the times of motion. This will be evident, from an inspection of the former figure; for in the triangle BDF, let B 1 represent the time in which a body acquires a certain velocity; then when it has attained the length of 2, the space passed over will be represented by a small square, being that of the first moment, and of a triangle representing the additional force the second moment.

19. The constant forces which accelerate bodies from a state of rest, are in a direct duplicate ratio of the velocities generated, and in an inverse ratio of the spaces described. Hence the following corollary is deduced, viz. that the last acquired velocities are in a subduplicate ratio of the accelerating forces, and a subduplicate ratio of the spaces described jointly.

20. If bodies unequal in quantity of matter be impelled from rest through equal spaces, by the action of moving forces which are constant, these forces are in a duplicate ratio of the last acquired velocities, and the ratio of the quantity of matter jointly.

In his observations on this proposition, our author takes occasion to consider the theory of those who insist, contrary to the opinion of Sir Isaac Newton that the absolute force of bodies is compounded of the quantity of matter and *square* of the velocity, instead of the velocity itself. "In the experiments (says he) which have been made on the force of bodies, the loss of motion from resistance has been more attended to than the communication of it by acceleration; and the reason probably arose from a want of adequate methods of subjecting accelerating forces, velocities acquired, and quantities of matter moved, to experimental trials; whereas the impact of bodies on substances which they penetrate, by affording convenient opportunity for observing the depths to which bodies sink before all motion is destroyed, regard being had to the velocities of impact, and the weight and form of the impinging body, has seemed a more eligible method, however imperfect, of investigating the principles of motion.—When a body descends for three seconds by the force of gravity, it acquires, by a force of acceleration, a velocity of $96\frac{1}{2}$ feet in a second: also, if a body be projected perpendicularly upward, with a velocity of $96\frac{1}{2}$ feet in a second, the whole velocity will be destroyed in three seconds; and in like manner, every other property demonstrated concerning accelerated motions is found to belong to retarded ones, provided we attend to the following circumstances: If in any proposition relating to accelerated motion, the force is constant, it follows, that when this is applied to retarded motion, the retardation must also be constant. Moreover, since in accelerated motions the spaces are estimated from quiescence, so in retarded motions the bodies are supposed to move to quiescence; that is, till all motion is destroyed by retardation: in whatever concerns motions of this kind, therefore, we must consider the retarding force to be directly as the force of resistance, and inversely as the quantity of matter.

"In order to illustrate this subject, it is to be observed, that if a body projected with different initial velocities be retarded by any constant given force, the whole spaces which the body describes are in a duplicate ratio of the initial velocities, which follows from what has been already demonstrated; and conversely, since when bodies are impelled by an accelerating force through various spaces, if these spaces are always as the squares of the last acquired velocities, it follows that the force of acceleration is constant: so when a given body is projected with different velocities, and is retarded by a given force, if the whole spaces described be always in a duplicate ratio of the initial velocities, it is concluded, that the force of retardation

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is constant. It is from this argument inferred, that the force whereby blocks of wood, banks of earth, &c. resist the penetration of bodies impinging on them, is constant; for it is observed, that the depths to which military projectiles of a given magnitude and weight, striking against a body of this kind, enter its substance, are in a duplicate ratio of the initial velocities, which has been sufficiently proved by Mr Robins, who first ascertained the velocities of military projectiles, and applied his method, among other useful purposes, to the discovery of the retardation which bodies suffer by passing through resisting substances.

"The forces of resistance, which are opposed to the motion of bodies impinging on substances which they penetrate, being granted constant, the propositions concerning acceleration already demonstrated may be applied to explain the motion of bodies, which, having been projected with given initial velocities, are interrupted by such obstacles as blocks of wood, banks of earth, or others of a similar kind.—For example, it has been demonstrated, that bodies moving from rest by the acceleration of constant forces, describe spaces which are as the accelerating forces and squares of the times jointly. By applying this proposition to retarded motions, we shall have the whole spaces or depths to which bodies impinging on the substances penetrate, as the forces of retardation and squares of the times wherein the bodies move, jointly. Moreover, it has been demonstrated, that if different quantities of matter be impelled from rest through equal spaces, the moving forces will be in a ratio compounded of the duplicate ratio of the velocities last acquired, and the ratio of the quantities of matter moved. It is from hence inferred, that in retarded motions also, if different quantities of matter be projected against any of the substances above described, with different initial velocities, and the whole depths to which the bodies penetrate are equal, the forces whereby the bodies resist the progress of the impinging bodies will be in a duplicate ratio of the initial velocities of impact and the quantities of matter jointly.

"By this proposition we may examine some of the experiments concerning the force of moving bodies, and the conclusions deduced from them by Bernoulli, Leibnitz, Poleni, &c. against the measure of force delivered by Sir Isaac Newton, which he described in the following definitions:

"The quantity of motion is measured by the quantity of matter in a moving body and its velocity jointly.

"The moving forces whereby bodies tend towards centres of attraction are as the quantities of motion generated in a given time.

"It follows, then, from these definitions, that the moving forces, acting for a given time, will be proportional to the quantities of matter moved, and velocities generated, jointly: so that if the ratio of the moving forces be known, and we can find by experiment what velocities are generated in given bodies by the action of them for the same time; the quantities of motion generated in the bodies may be estimated according to Sir Isaac Newton's definition. Moreover, since it is allowed that the effects of a resisting force to destroy are the same as those of an equal force to generate motion in a given time; it follows,

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that if the ratio of two resisting forces be known, the quantities of matter in bodies which impinge on substances, and penetrate them, and the velocities destroyed in a given time, will give the ratio of the quantities of motion destroyed, according to Sir Isaac Newton's definition.

"In many of the experiments alluded to, which have been greatly varied and multiplied, the resisting forces were made equal, by causing spheres equal in magnitude to impinge on a given substance which they penetrated; and the spheres being of given densities, it was observed in experiments, that whenever the densities or weights of those equal spheres were in an inverse duplicate ratio of their velocities, the depths to which they penetrated would be equal. The conclusions were these: the quantities of matter displaced by the moving bodies were equal, the depths to which the equal spheres penetrated were the same. Moreover, the whole motions which had been communicated to the bodies were destroyed; that is, the whole motion of the impinging bodies must have been as the squares of the velocities into the quantities of matter. But it plainly appears, that this conclusion is not applicable to the Newtonian definition, according to which the moving force generates motion in bodies: and it follows by what has preceded, that the resisting force by which the motion of bodies is destroyed, is proportional to the quantities of motion generated or destroyed in a given time respectively; and consequently, to estimate the quantity of motion destroyed, the time wherein resisting forces act should be equal. If, therefore, the times wherein the bodies in the experiment describe the equal spaces can be proved different, this will plainly show that the quantities of motion destroyed cannot be inferred from the experiment, the different times of the bodies describing the depths to which they sink not being taken into the account: this will be easily proved, since from proposition 17. it appears, that the spaces described are universally as the velocities and spaces last described jointly; and from what has been said, the converse of this proposition when applied to retarded motions must also be true. The spaces therefore being given as in the experiment, the times will be inversely as the initial velocities; which velocities being unequal from the experiment, it follows that the times are unequal. This being the case, it is manifest that no conclusion can be drawn from these experiments concerning the quantity of motion destroyed, tending to prove any inconsistency between the Newtonian estimation of force and matter of fact.

"It is next to be shown, that the experiments are strictly consistent with the Newtonian measure, and with the theory in general.—It has already been proved, that in accelerated motions the spaces described are in a duplicate ratio of the velocities last acquired, and the quantities of matter moved, and an inverse ratio of the moving forces. This proposition being applied to retarded motions, it will follow, that the whole spaces or depths to which the impinging bodies sink, are in a duplicate ratio of the quantities of matter, and an inverse ratio of the resisting forces; whence also the depths to which the bodies penetrate must be equal when spheres of equal diameters are projected against a given substance, the weights being in an inverse duplicate

Fig. 101.

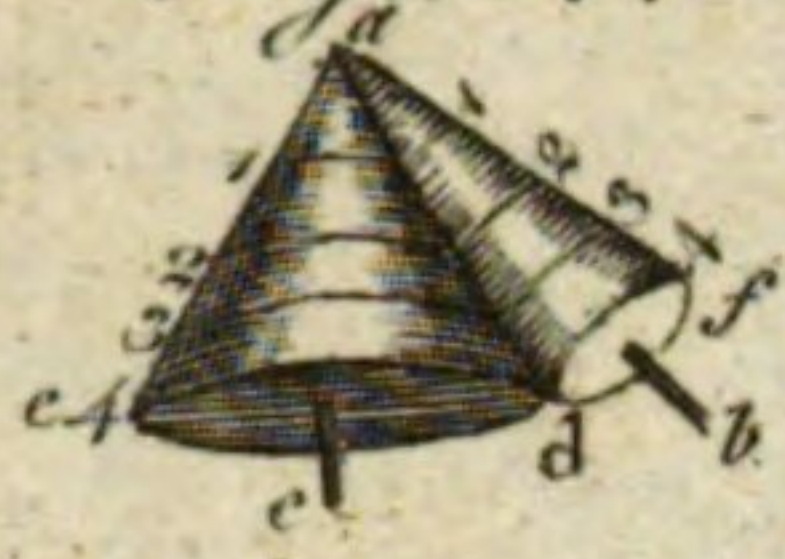


Fig. 102.

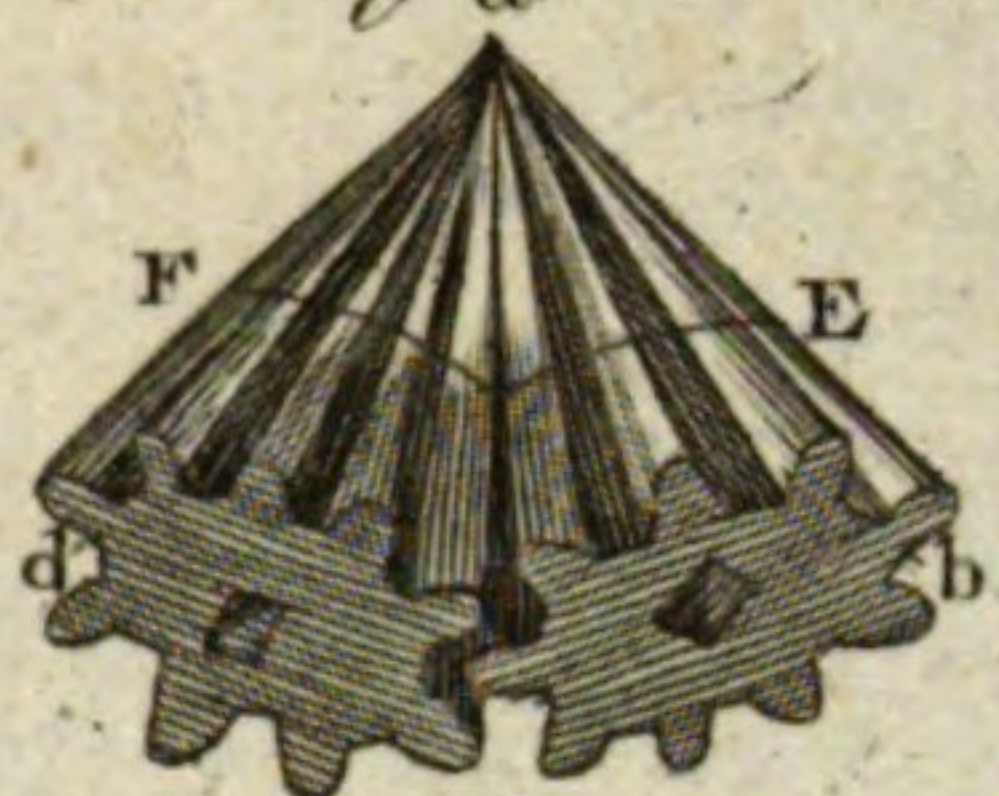


Fig. 103.

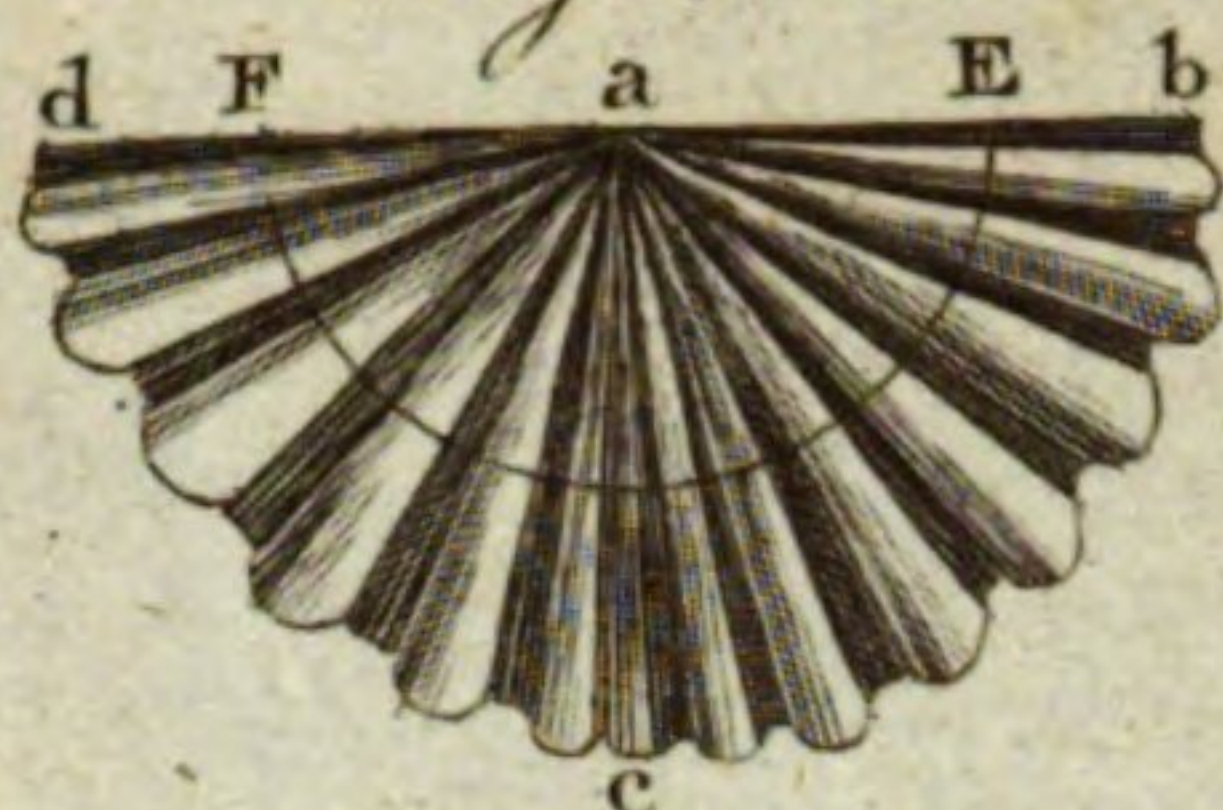


Fig. 104.

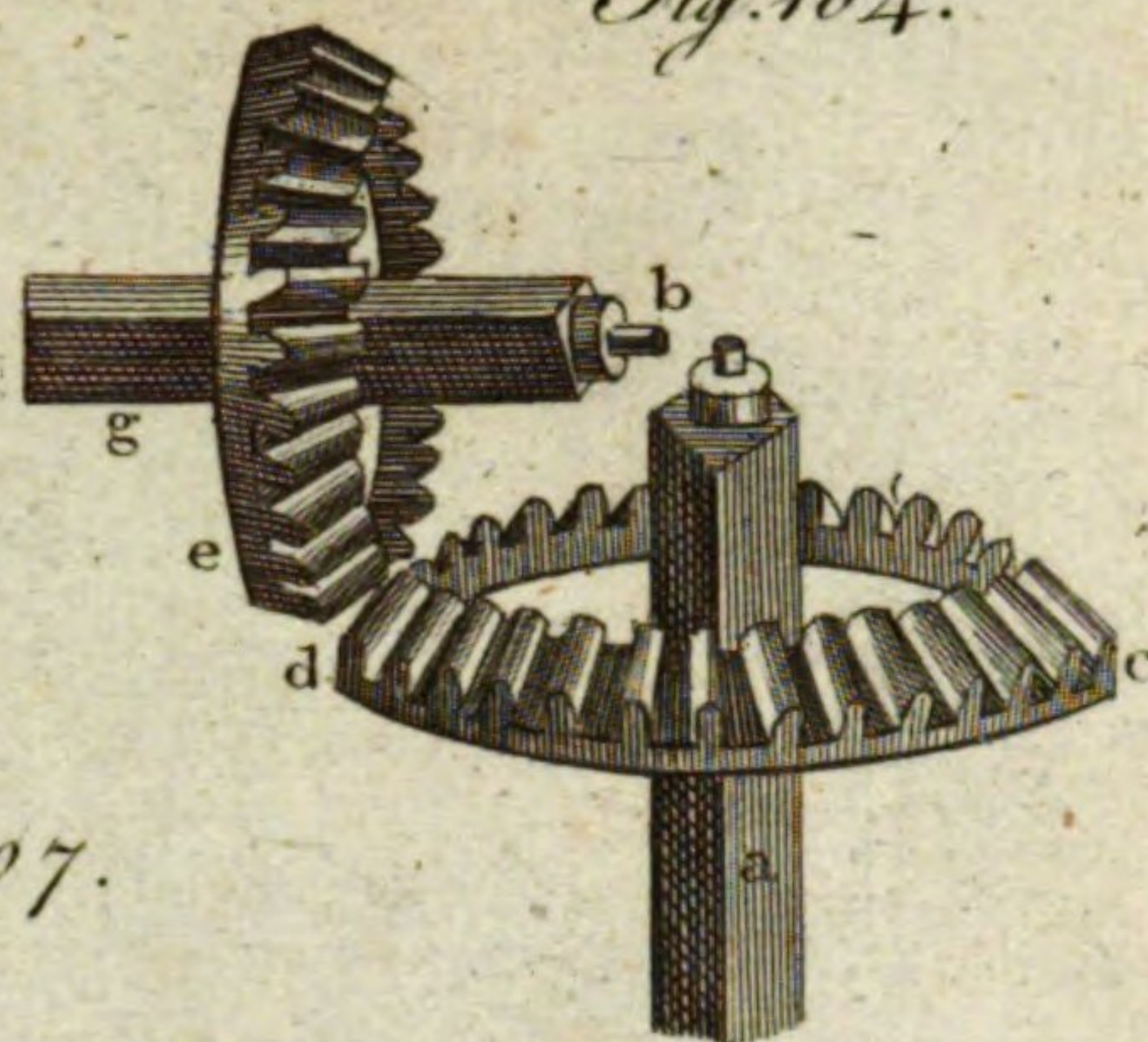


Fig. 105.

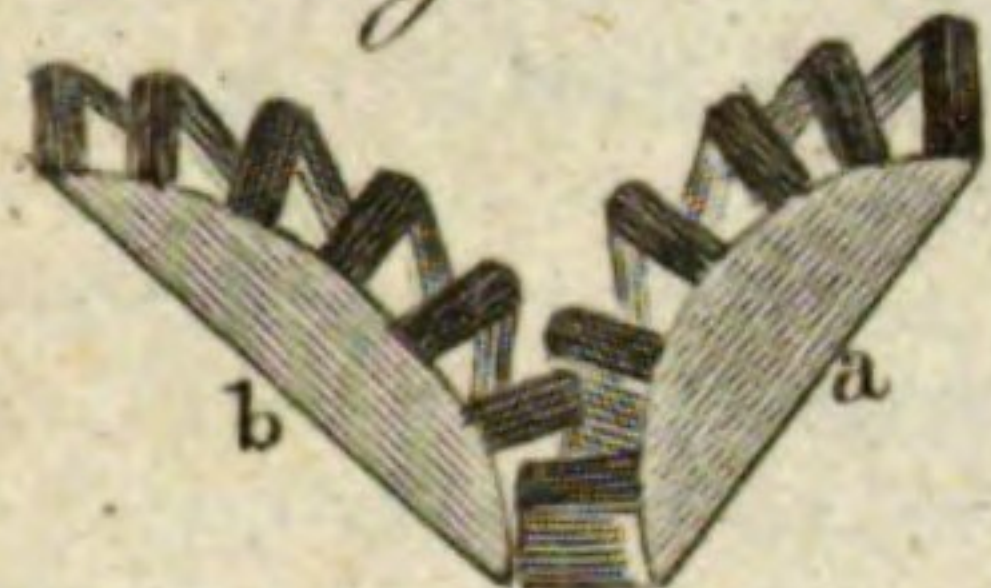


Fig. 106.

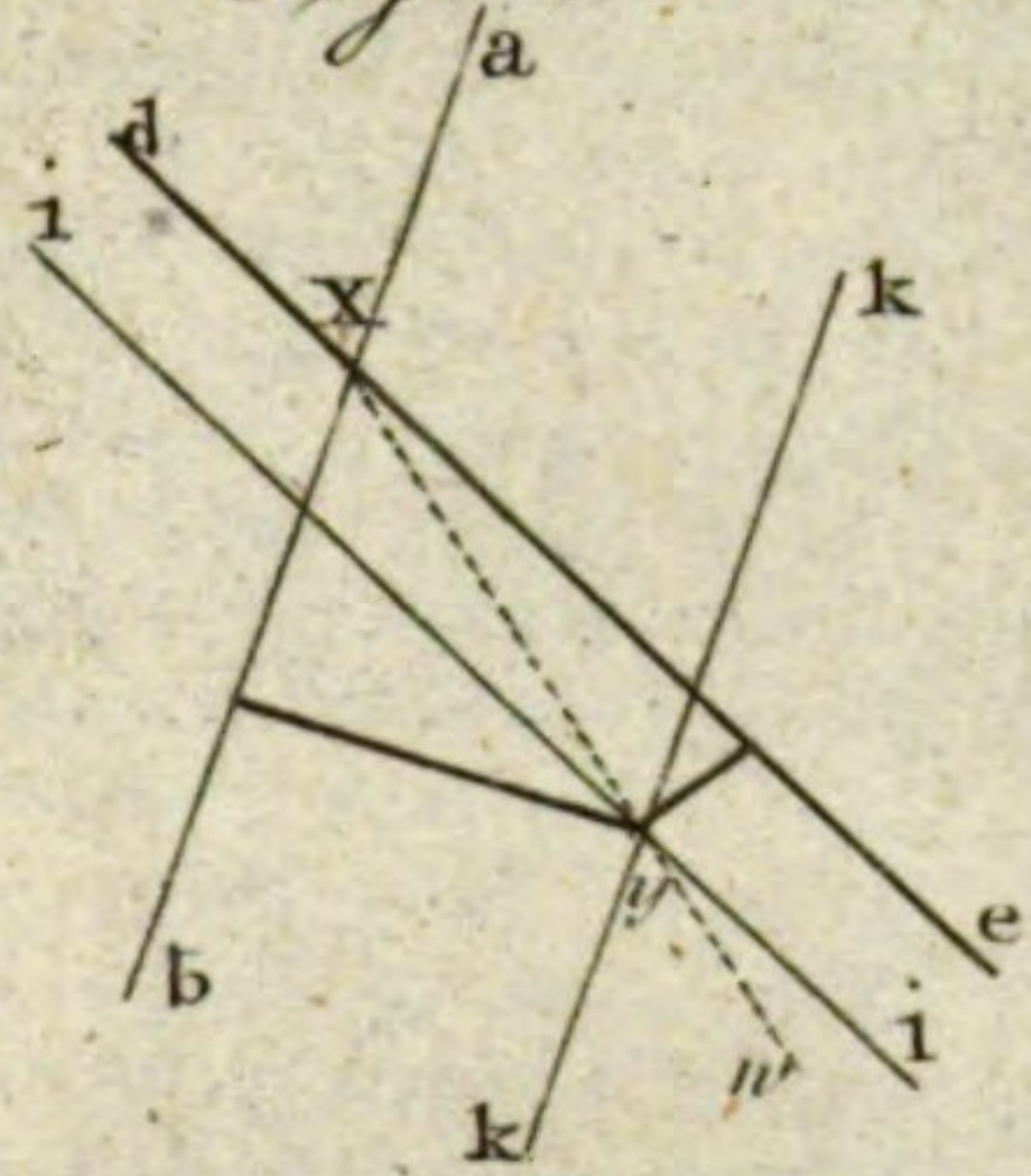


Fig. 107.

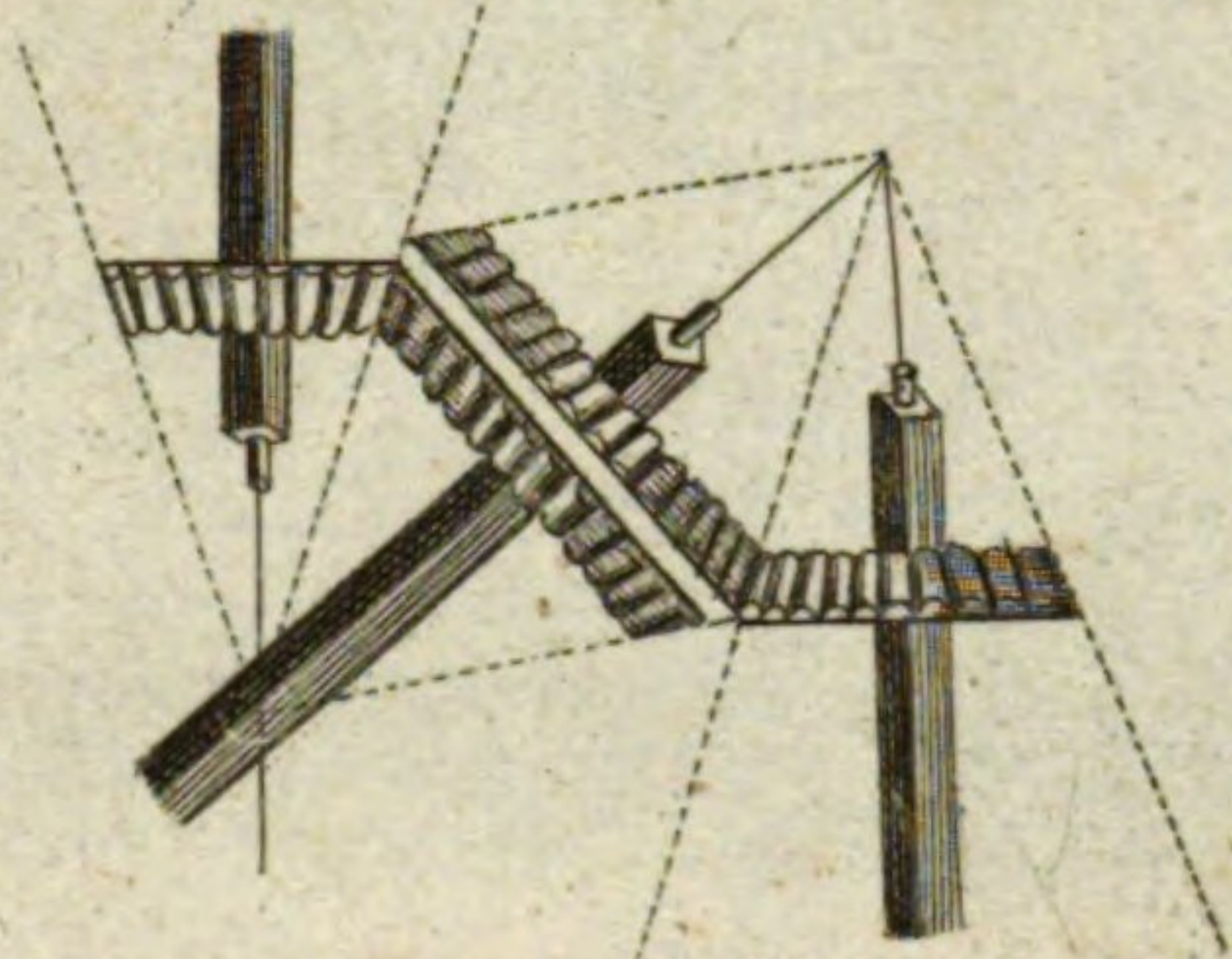


Fig. 108.

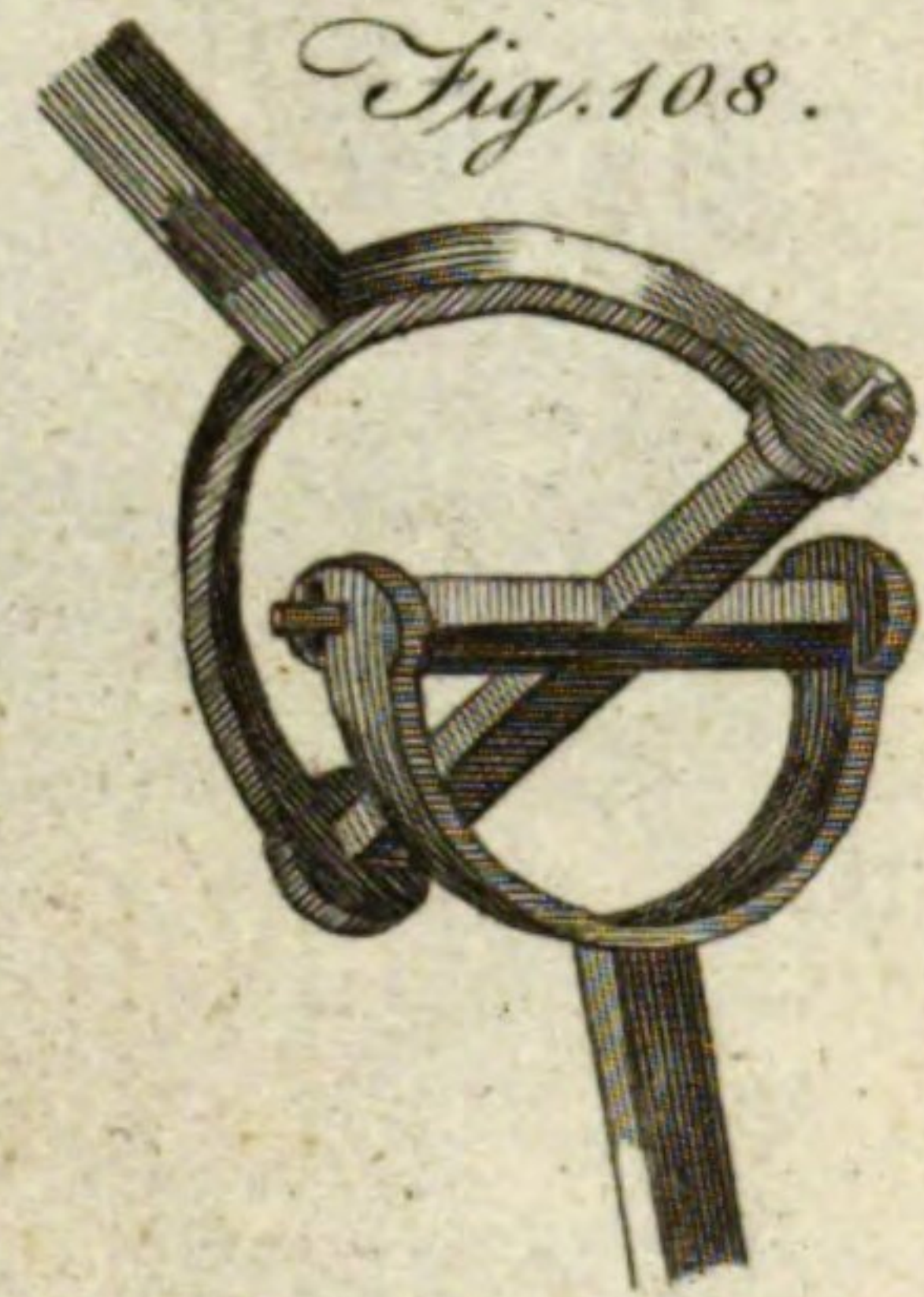


Fig. 109.

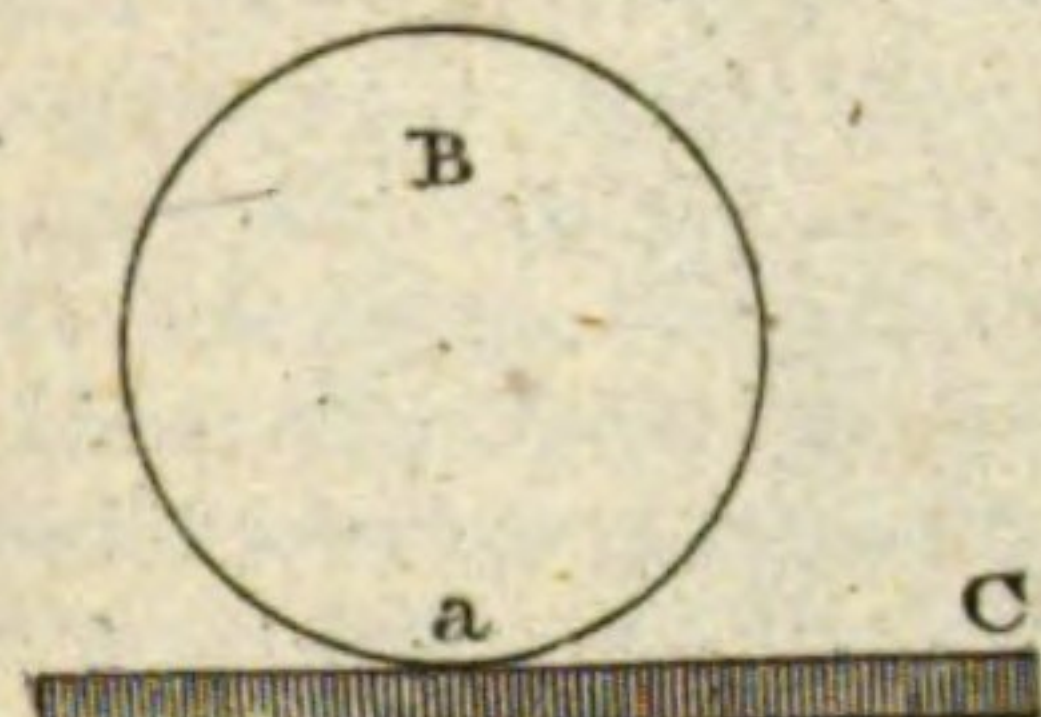


Fig. 112.

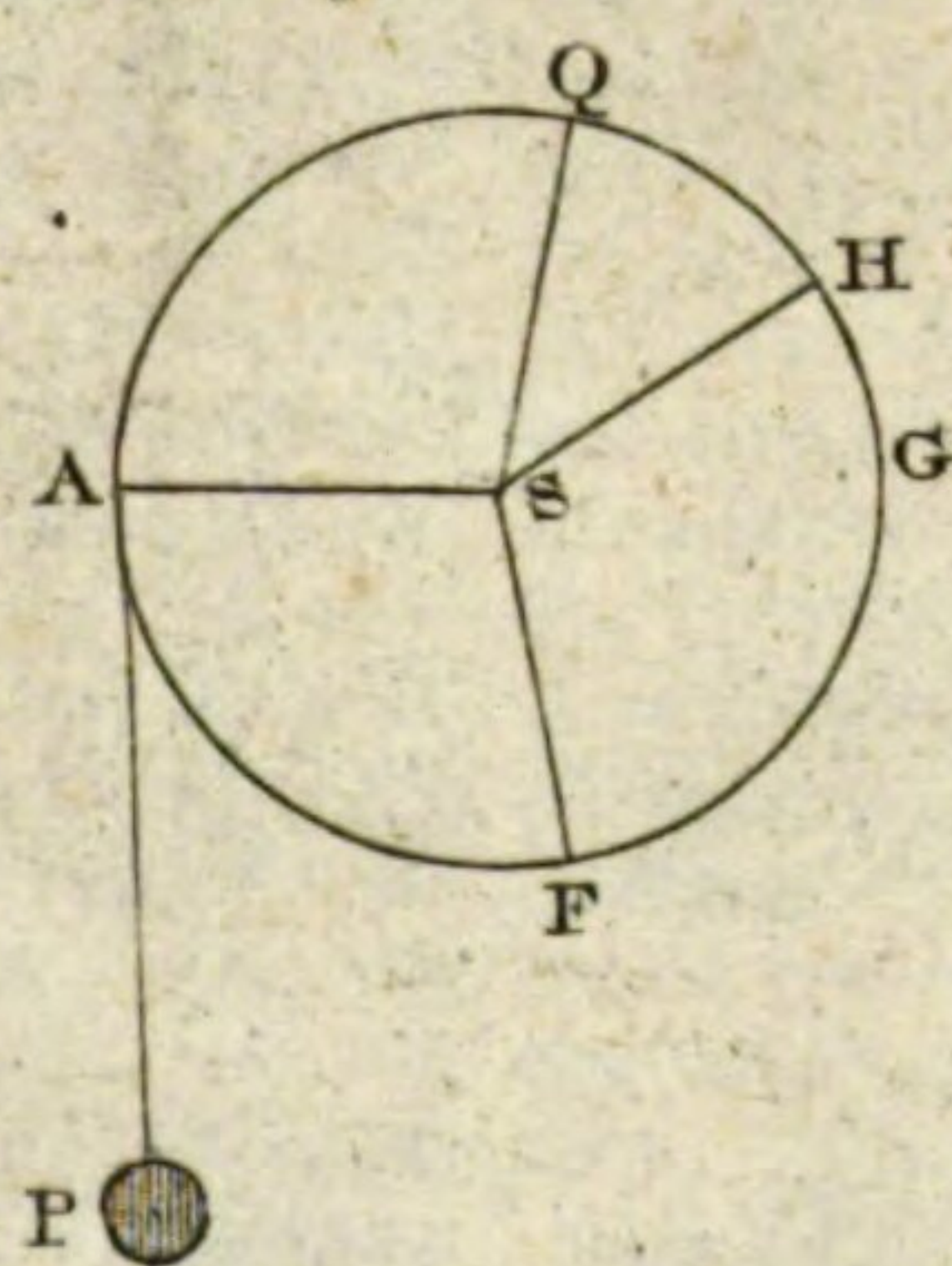


Fig. 113.

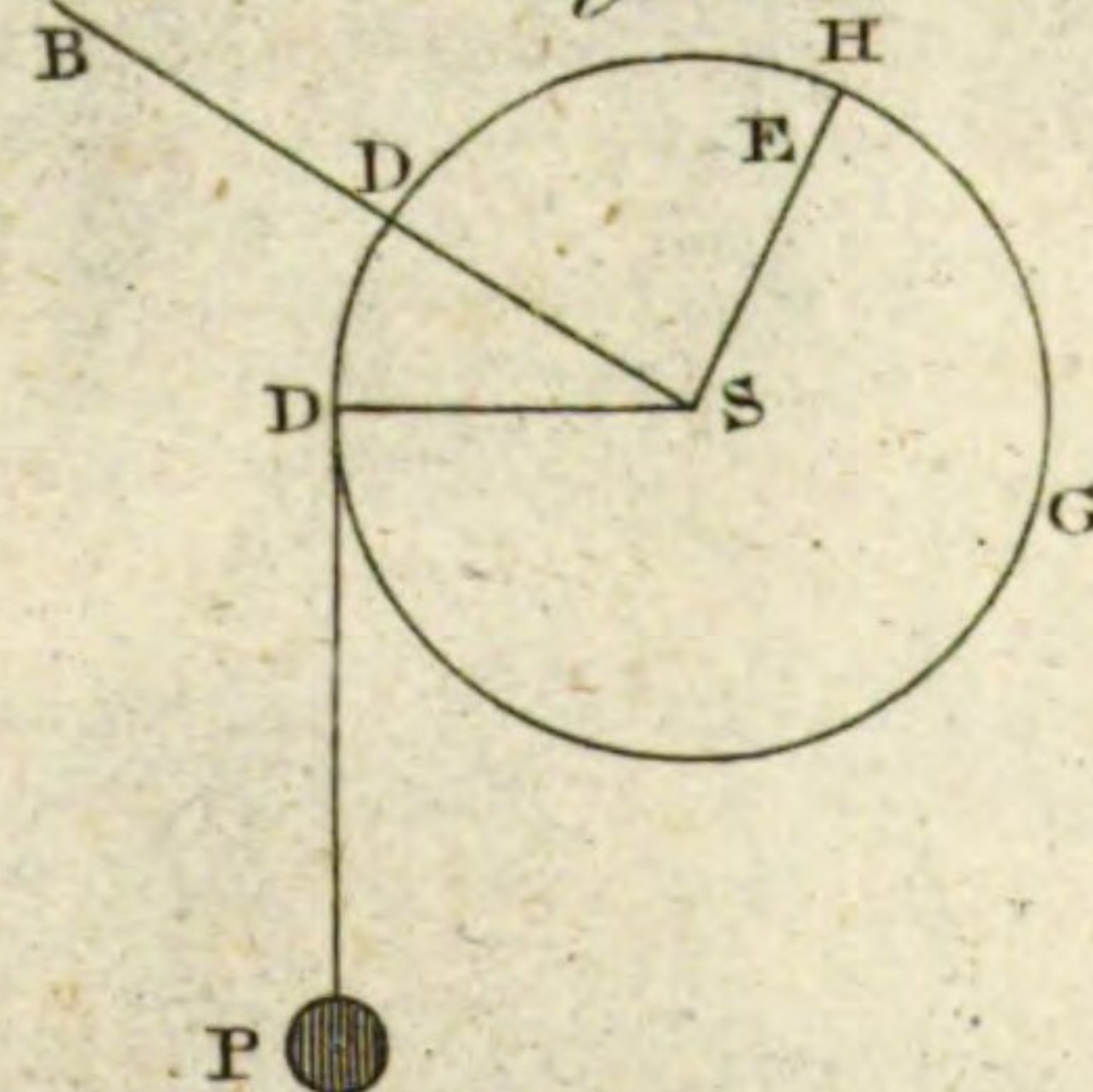


Fig. 110.

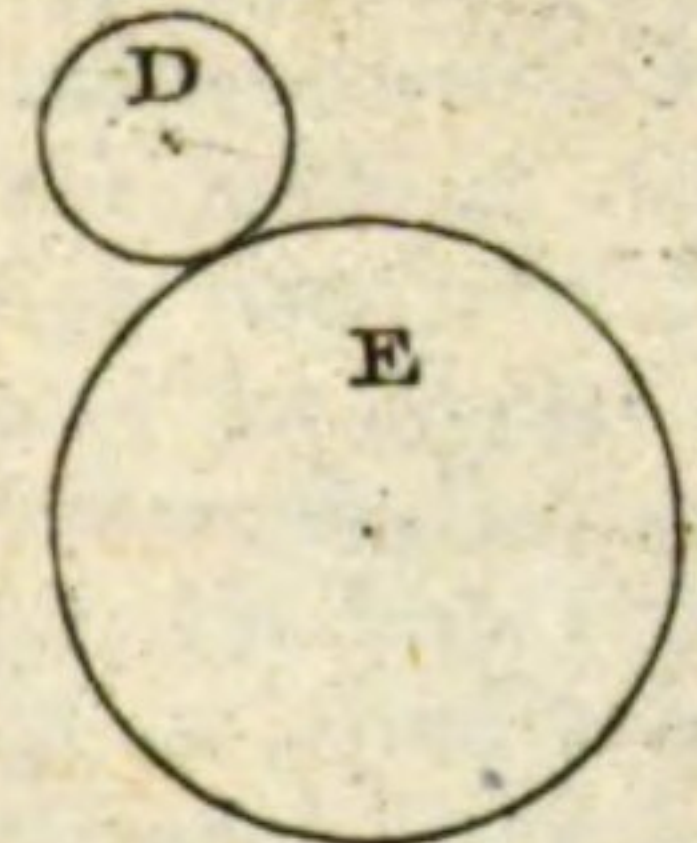


Fig. 111.

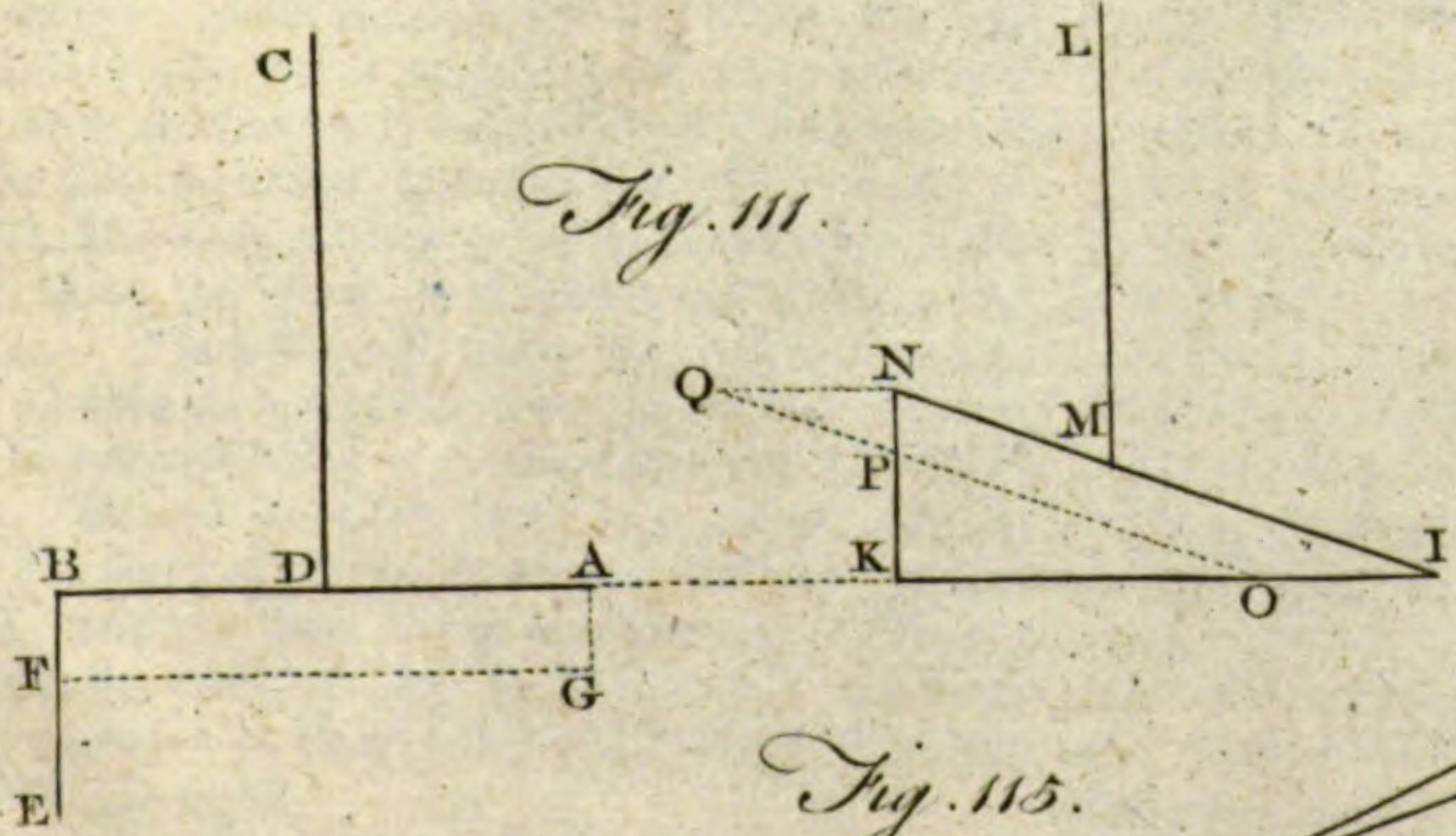


Fig. 115.

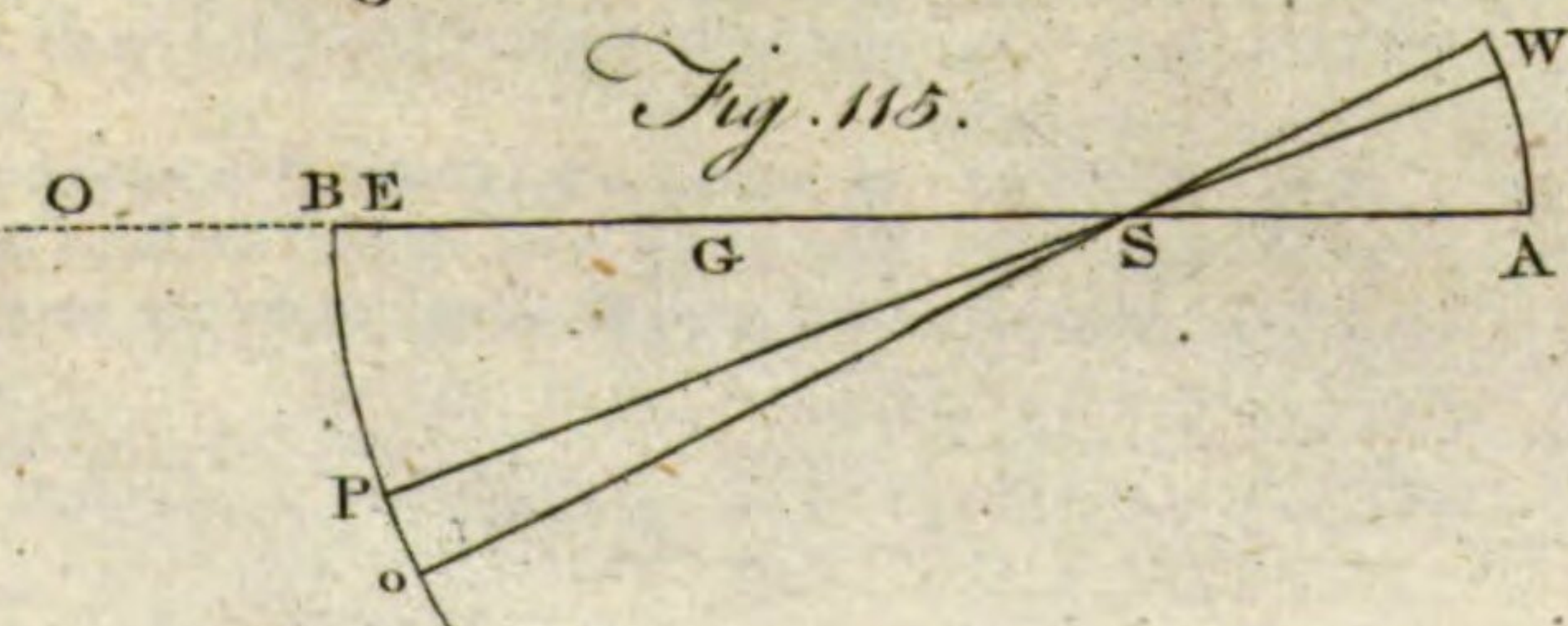
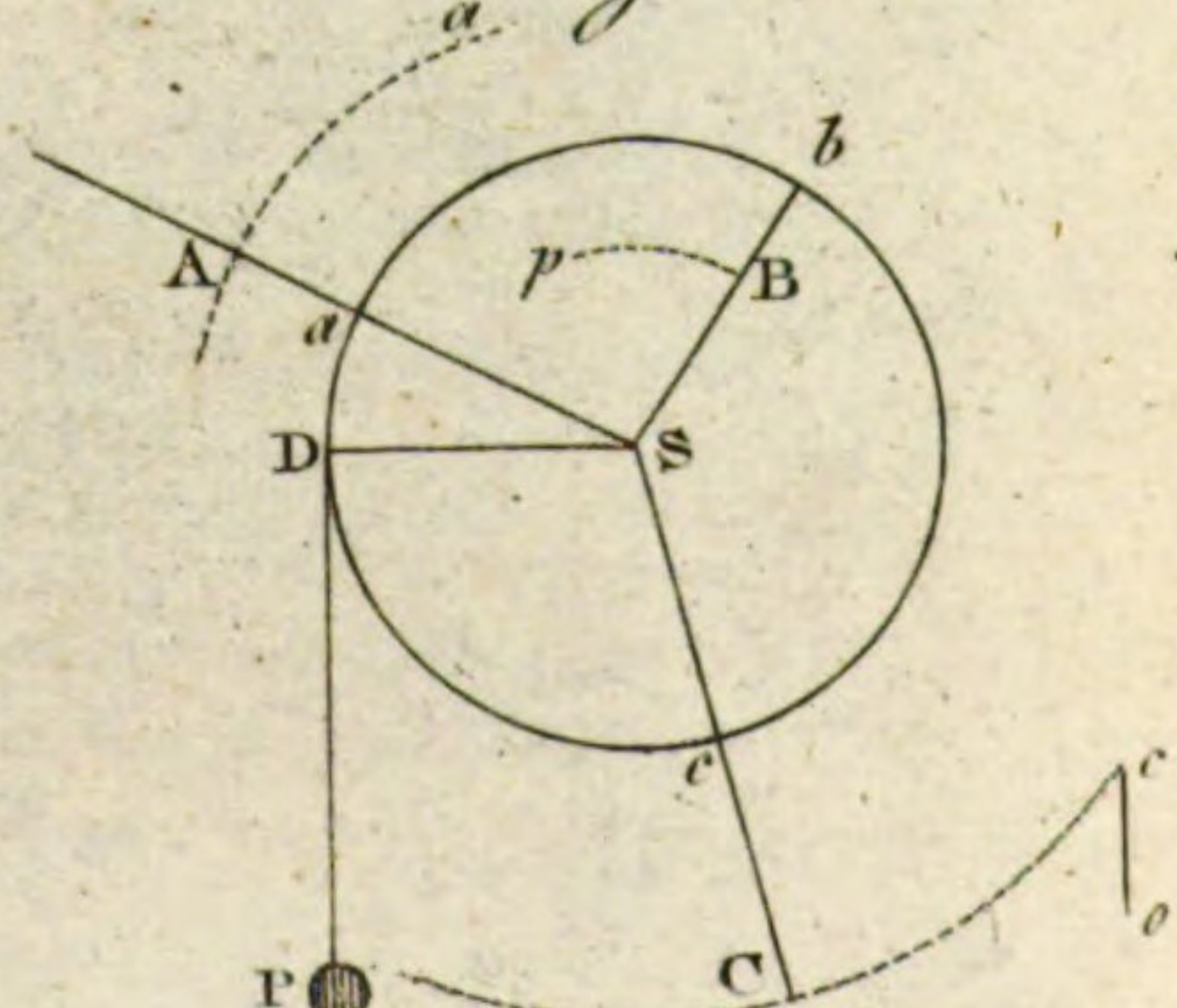
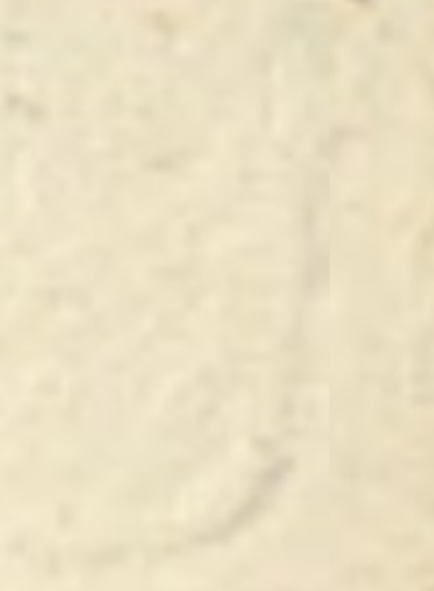


Fig. 114.



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duplicate ratio of the initial velocities, which we find entirely correspondent to experiment. It seems indeed rational to suppose, independent of all theory, that, in estimating the quantities of motion generated or destroyed by given moving or resisting forces, regard must be had to the times wherein the forces act; because moving forces, or those of resistance, may be equal, and may generate or destroy quantities of motion varying in any assignable degree. For it is manifest, that a small resistance, opposed to a moving body for a longer time, may destroy more motion than a greater force acting for a shorter time; which sufficiently shows, that the times wherein the moving and resisting forces act, must either be equal, or must be taken into the account in estimating the quantities of motion generated or destroyed.

21. The moving forces which communicate, and the forces of resistance which destroy, the motion of bodies in the same time, will be in a compound ratio of the quantities of matter in the moving bodies and velocities generated or destroyed.—This and the preceding propositions have been fully illustrated and confirmed by experiments. From them we deduce the following facts: 1. When musket-balls, equal in weight and magnitude, impinge on a block of wood with different velocities, the resisting force being constant, we shall have the whole spaces through which the balls move in the wood as the squares of the velocities. 2. If balls of equal diameters, but different weights, impinge against a block with the same velocity, we have the depths to which they penetrate the block as the weights. 3. If balls of the same kind of substance, that is, of the same density, but of different diameters, impinge against a given block of wood or the same bank of earth with equal velocities, the depths to which they penetrate will be directly as the diameters of the balls.

When the force of resistance is not uniform, the same principle obtains in degree, though the laws are then various; for greater bodies always suffer less by retardation than smaller ones of the same density, moving through the same resisting medium, and projected with a given initial velocity: because, though the force of resistance increases with the increase of the body's magnitude, yet the weight in most bodies increases in a greater proportion. Thus, in cannon-balls, and other solid bodies, though the resistance of the air increases as the square of the ball's diameter, yet the weight increases as the cube. Thus, if a ball two inches in diameter is projected from the mouth of a piece, it is resisted by the atmosphere four times less than one four inches in diameter; but the weight of the latter, being eight times greater, makes the resistance less upon the whole in the large ball than in the small one. It is otherwise when the weight does not increase in this manner; for then the smaller the body is, the less resistance it meets with, and the faster it goes. This is manifest from aerostatical experiments; for small air-balloons always outstrip the larger ones: and the same thing is observable in boats; for the smaller ones, if they have the same advantages in proportion to their bulk, will always sail faster than the larger ones.

22. If bodies, projected with the same velocity, be retarded by different constant forces, these forces will be in an inverse ratio of the whole spaces described by

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the projected bodies, until all motion is destroyed.—For example, let a body be projected on an inclined plane, in a direction contrary to that in which gravity acts in the plane, and with a velocity of 144.467 inches in a second. Suppose the body then projected, ascending along the plane, to describe 216 inches before its motion is destroyed; let it be required to ascertain the retarding force which opposes its ascent, that is, the proportion of it to the force of gravity. If the body were projected perpendicularly upward, with the given velocity of 144.467 inches in a second, it would rise only to 27 inches, as follows in Prop. 19. And since it ascends along the plane 216 inches, the retarding force on the plane will be to that of gravity as 27 to 216, or as 1 to 8; which is also the proportion of the height of the plane to the length of it.

From this proposition, having given the depth to which a body impinging against another penetrates it, the proportion of the retarding force of gravity may be determined. For example, Mr Robins found that a leaden ball of $\frac{3}{4}$ of an inch, or $\frac{1}{8}$ of a foot in diameter, impinging on a block of elm with a velocity of 1700 feet in a second, penetrated it to the depth of five inches, or $\frac{5}{12}$ of a foot; wherefore, since a body projected upwards with a velocity of 1700 feet in a second, would rise, if the atmosphere made no resistance, to the height of 44922 feet, we have the force by which elm retards the ball to the force of gravity as 44922 to $\frac{5}{12}$; or as 107.813 to 1.

On this theory it may further be observed, that the resistances opposed to spherical bodies, which impinge on a block of wood, a bank of earth, &c. depend not only on the tenacity or density of the parts, of which the penetrated substances are composed, but upon the diameters of the impinging spheres: so that, although the resisting and retarding forces be determined in any substance for a single case; yet when the diameters and weights of the impinging bodies vary, the forces of resistance and retardation opposed to the impact on the same substance will be different. By the preceding proposition, however, we may be enabled, from a single experiment made on the retardation of any substance opposed to a sphere, the weight and diameter of which are known, to infer the retardation in any other case, however the weights and diameters may vary.

23. If spheres of different diameters and different specific gravities impinge perpendicularly on fixed obstacles, the resisting forces of which are constant, but of different quantities, the forces which retard the progress of the impinging spheres will be in a direct ratio of the absolute forces of resistance, and the joint inverse ratio of the diameters and specific gravities of the spheres. No absolute conclusion can be drawn from this proposition concerning any matter of fact, unless an experiment be first made on the retarding and resisting force of some substance which is to be considered as a standard.

24. The whole spaces or depths to which spheres, impinging on different resisting substances, penetrate, are in the ratio compounded of the duplicate ratio of the velocities of impact, the joint ratios of the diameters and specific gravities of the spheres, and an inverse ratio of the absolute forces whereby the substances resist the progress of the spheres.

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Mr Atwood concludes this section with some problems relative chiefly to military projectiles; and in his next section (the 4th) considers the rectilinear motion of bodies acted upon by forces which vary in some ratio of the distances from a fixed point. This section chiefly relates to the powers of gravity and projection, by which the celestial bodies are actuated, and which consequently chiefly regards astronomy and the motion of pendulums; though there are likewise some curious particulars relating to the action of compressed air, the vibration of musical strings, and the undulation of fluids. The fifth section considers the motion of bodies immersed in fluids; but the sixth treats of a subject which properly belongs to mechanics, viz. the communication of motion to bodies revolving round an axis.

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In treating this subject Mr Atwood observes, that in the former part of his work he had supposed the accelerating, as well as resisting, forces, to act upon the body in a straight line passing through the centre of gravity of the moving; in which case every particle of the body must partake of the same degree of velocity, being equal to that with which the common centre of gravity moves. "But (says he) it frequently happens, that a body, or system of bodies, is so constituted, that when any force is impressed upon it, no motion can be produced except round a fixed axis; so that the velocity of the particles which compose the system will be greater or less according as these particles are farther from the common axis or nearer it. These circumstances should be attended to, in order to ascertain the motion of revolving bodies; the preceding principles of acceleration being not wholly of themselves sufficient for that purpose.

"In this investigation two things must be attended to. 1. The moving force by which the revolving motion is generated; and, 2. The inertia of the parts of which the system is composed. The moving force exerted on any given particle of the system, as well as its inertia, depends on its distance from the axis of motion, every thing else being the same; and if both these be ascertained, the absolute acceleration of the particle will be determined, and consequently the absolute velocity generated in a certain time. The methods therefore of determining these forces in any given circumstance should next be described.

"Let AFGH (fig. 112.) represent the circumference of a wheel which turns in its own plane round an horizontal axis, passing through its centre; and let a weight P, fixed at the extremity of a line AP, communicate motion to the wheel. Moreover, let the whole weight of the wheel be Q; and suppose this weight to be collected uniformly into the circumference AFGH; then, during the descent of the weight P, each point of the circumference must move with a velocity equal to that with which P descends; and consequently, since the moving force is the weight P, and the mass moved $P+Q$, the force which accelerates P in its descent will, by Prop. 14. be that part of the accelerating force of gravity which is expressed by the fraction $\frac{P}{P+Q}$. The velocity, therefore, which is generated in P in any given time, is found from the rules before demonstrated. Thus, supposing Q to be

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equal to P, then will $\frac{P}{P+Q} = \frac{1}{2}$; and the weight P will be accelerated by a power which is to that of gravity as 1 to 2; and since gravity generates in bodies which descend for one second of time near the earth's surface a velocity of $32\frac{1}{2}$ feet in a second; it follows, that the weight P will in the same time have acquired a velocity of $16\frac{1}{2}$ feet in a second only.

"The parts of the weight Q which are uniformly disposed over the circumference AFGH, balance each other round the common centre of gravity S; their weight therefore is of no effect in accelerating or retarding the descent of P: and this will be the case whenever the axis of motion passes through the common centre of gravity. But in order to render the properties of rotatory motions more obvious, it will be convenient to dispose the parts of the revolving system so that the axis of motion shall not necessarily pass through the common centre of gravity: thus, instead of having the weight Q uniformly disposed over the circumference AFGH, let it be collected into any point Q. Here it is manifest, that if the mass Q be acted upon by gravity, the force which communicates motion to the system round S will be variable, it being the greatest when SQ is horizontal, and gradually diminishing till Q has arrived at its lowest point. But as we should begin with the most simple cases, the moving force must be constant. This will be effected by supposing the mass which is collected in Q to be destitute of weight, and to possess inertia only. It follows therefore, that during the revolution of Q round S as an axis, the moving force will be constantly equal to P, and the mass moved $= P+Q$. Consequently the force which accelerates the descending weight, or any point in the circumference, will be that part of gravity which is expressed by the fraction $\frac{P}{P+Q}$ as before.

"In these cases, the force which communicates motion to the system has been supposed a weight or body acted upon by the earth's gravity, and consequently constitutes a part of the mass moved, at the same time that it acts as a moving force: but motion may be communicated by a force which shall add nothing to the inertia of the matter moved: and it will be convenient in many demonstrations to assume the force of this kind; and in this case we have not to take the inertia into the account. Thus if any number of bodies without gravity collected into the points F, H, Q, (fig. 112.) are caused to revolve round the axis S, by a moving force P, the force which accelerates these bodies in their revolution will be $\frac{P}{F+H+Q}$; provided the bodies F, H, Q, be disposed at a distance from the axis of motion equal to the radius of the circle AFGH, at the circumference of which the moving force P is applied.

"In the preceding example, F, H, Q, &c. have been supposed to move with the same velocity; but when bodies revolve at unequal distances from the axis, their velocities of motion being different, other rules will be necessary to determine the force whereby any given point of the system is accelerated. In demonstrating the properties of rotatory motion, the revolving

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ving system may be supposed to consist of one or more of the bodies A, B, C: the magnitude of these may be supposed evanescent; because, were the contrary supposition adopted, the particles in each body would be impelled by different moving forces, and exert different degrees of inertia in opposition to the communication of motion. But the force which impels each individual particle, and the effects of its inertia in different circumstances, must be known before the acceleration of the whole system can be determined.

"The bodies A, B, and C, which may be termed, according to the ideas just described, material points, are imagined to be connected together by some perfectly rigid substance, so as always to possess the same situation in respect to each other: and consequently no motion can be produced in any of them, excepting that all revolve at the same time round the common axis of motion.

"All the points in this imaginary substance, by which the parts of the system are connected together, partake of the same angular motion, describing circles round the common axis S. A force P therefore being applied to any point in the plane of its motion, and in the direction of any line in that plane which passes not through the axis, will communicate an equal angular motion to the whole. Thus let B (fig. 113.) represent a material point moveable about an axis of motion passing through S. With the radius SD describe a circle DGH. Now if B be connected with every point in the area of this circle, which is an inflexible substance, no force can be applied to move the circle but what must communicate the same angular motion to B. Let the force be applied at the point D; it is manifest, that in order to render its effects constant, the inclination of its direction to SD must be always the same, and in a given plane; and the most obvious method of effecting this, either in considering the subject theoretically, or in the practical illustration of it, is by applying a thin and flexible line GHDP round the circumference of the circle DGH, and stretching this line by a given moving force P. Here it is plain, that in whatever part the point D is situated, the effects of the force P will be the same as if it were directly applied to D in the direction of the plane of motion, and perpendicular to SD, and the point B will revolve with the same absolute and angular velocity in both cases.

"Let now ABC (fig. 114.) be a system of bodies of evanescent magnitude and without gravity, moveable about an axis of motion which passes through S; it must be observed, that the imaginary substance by which the parts of the system ABC are connected, must contribute nothing either by its weight or inertia to accelerate or retard the motion of the material points A, B, C, which are caused to revolve by the action of the given and constant force P, applied at the distance from the axis SD. The absolute force of P to move D, or any point of the circumference, will be P; but the communication of motion to this point D is resisted by the inertia of the bodies A, B, C; which being moved with different velocities, and acted on by different moving forces, their inertia will not be estimated by their quantities of matter only, according to the laws observed in rectilinear motion: the force

which accelerates D, therefore, cannot be obtained by dividing P by $A+B+C$; but if an equivalent mass, or a quantity of matter, can be assigned, which being collected into any points of the circumference a, b, c , will cause an inertia or resistance to the motion of D equal to that exerted by the particles A, B, C, when revolving at their respective distances, the force which accelerates the circumference or any point in it D will be determined. Thus, let the mass Q, when collected into a , be such as will be equivalent in its inertia to A, when revolving at the distance SA; also let R be the mass collected into b , which is equivalent to B when revolving at the distance SB; and let T, the mass collected into C, be equivalent to C when revolving at the distance SC; then will the mass moved by the force P be $Q+R+T$; and the force which accelerates the circumference $= \frac{P}{Q+R+T}$, being equal to

that by which the circumference or any point in it is accelerated when the point consists of A and B and C, revolving at the respective distances from the axis of motion SA, SB, SC."

Our author now proceeds particularly to investigate the motion of revolving bodies in almost all possible circumstances, deducing from his propositions many conclusions very useful in practical mechanics. Many of these regard the pendulum, and are therefore taken notice of under that article; others more immediately relate to the parts of mechanics particularly treated of in this article: the principal of which follow.

1. The force which accelerates the centre of gravity of a sphere, while it rolls down an inclined plane, is to the force by which it would be accelerated were it to slide in the ratio of five to seven. As our limits will not admit of inserting at length the demonstration of this and other propositions, we shall in this only observe, that when a wheel or a sphere rolls, the circumference goes backward, while the centre moves forward; which retrograde motion must of necessity make the other slower than it would otherwise be: and this retardation Mr Atwood has determined to be in the proportion above-mentioned.

From this proposition the following corollaries are deduced. 1. The absolute force whereby motion is generated in the circumference of a sphere in such a situation, is expressed by a fraction consisting of twice the weight of the sphere divided by seven, and multiplied into another fraction consisting of the height of the plane divided by its length; that is, suppose the weight of the sphere to be represented by w , the height of the plane by h , and its length by l , the force by which the circumference of the sphere is impelled will be represented by $\frac{w}{7} \times \frac{h}{l}$.

2. In the same manner, let a cylinder roll down an inclined plane, keeping the axis always horizontal, and the force which accelerates the axis will be represented by the fraction $\frac{2}{3} \times \frac{h}{l}$.

2. Let AB (fig. 115.) represent a straight lever moveable round an horizontal axis of motion, which passes through S. Let the arms be SB, SA. Suppose a weight W to be affixed to the extremity of the

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shorter arm, and to be raised by the weight P applied at the extremity of the longer arm, when the lever is horizontal. Required to determine the time in which W will be raised through any given height, the weight and inertia of the lever itself not being considered.

"When there is an equilibrium (says Mr Atwood) on any mechanic power, the proportion of the weight sustained to the power sustaining it, will, in all cases, be assigned from having given the dimensions of the mechanic power. An equilibrium having been once formed, the smallest addition of weight will cause the body to which it is applied on either side to preponderate. In this case a certain degree of motion is generated; and since the uses of the mechanic powers are not only to sustain forces in equilibrio, but to raise weights and overcome resistances, it is a problem of principal consequence to assign the absolute quantity of motion generated by a known moving force in given circumstances." The general solution of the problem is as follows:

"Let AB be the lever, W the weight moved by the power P; each acting in a direction perpendicular to the horizon. Let G be the common centre of gravity of the whole system, including the weights P and W with the lever itself; and o the centre of oscillation *, when AB vibrates round the axis S; the force which accelerates B when the lever is horizontal

$$= \frac{SG \times SB}{SG \times SO} = \frac{SB}{SO} \text{ (c). If this be put } = F, \text{ the time}$$

wherein P descends through a perpendicular space x , and consequently wherein W ascends through the cor-

responding space; then $x \times \frac{SA}{SB} = \sqrt{\frac{x}{F}} \times \frac{1+x^2}{SB^{2.5}}$,

$$\&c. = \sqrt{\frac{x}{F}} \times \frac{SO}{SB} \times 1 + \frac{x^2}{SB^{2.5}}, \&c.$$

3. Let ABC (fig. 116.) represent a wheel and axle, its weight w , and let the axis be horizontal; having a given weight Q applied to the circumference of the axle, and P applied to the circumference of the wheel in order to raise Q. Required to assign the space described by the elevated weight Q in any given time. The solution of this problem, without attending to the demonstration, is this. Having found the accelerating

power, which here is $\frac{P \times SD - Q \times SA \times SA}{w \times SR^2 \text{ (E.)} + P \times SD^2 + Q \times SA^2}$

All this he puts $= F$; and then l being $= 193$ inches as before, the space described by Q in any number of seconds will be $=$ the square of that number of seconds multiplied into lF . On this proposition our author makes the following observations.

"Whenever motion is communicated to a body, a certain resistance must have been overcome by the moving force. This resistance is of various kinds. 1. The inertia of the mass moved, whereby it endeavours to persevere in its state of quiescence, or of uniform motion in a right line. 2. That of a weight or other

absolute force opposed to the action of the moving power. 3. Obstacles upon which the moving body impinging is retarded in its progress: such, for example, is the resistance which arises from the particles of a fluid thro' which a body moves. The estimation of these resistances, and their effects in retarding the motion of bodies acted on by a given force, are deducible from the laws of motion, and constitute a part of the solution of almost all problems relating to the motion of bodies.

"The moving forces also are of various kinds, viz. The power of gravity, muscular power, the impact of bodies, solid and fluid, &c. It has been shown, that the effects of these moving forces which are exerted on bodies in order to create motion, exclusive of the resistance opposed to them, depend on the various circumstances of the time in which they act, and on the spaces through which the bodies moved are impelled, &c.

"These considerations are urged, to show, that from the great variety of undetermined conditions which may enter into mechanical problems, there must of course be various methods of producing the same mechanical effect: and it is a very material part of the art, considered either in a theoretical or practical view, to proportion the means to the end, and to effect this with all the advantages which the nature of the case is capable of. It is the due observation of these particulars which contributes to render mechanic instruments complete, and the neglect of them defective, in their construction. This proper choice of means to produce mechanical effects, is frequently the result of long continued experience independent of all theory; the knowledge of which, however, when applied to practice, would save the artist much time and trouble, as well as would be productive of other advantages, which experience alone must be destitute of."

4. ABC (fig. 116.) is a wheel and axis moveable round an horizontal axis, which passes through S. Suppose a given weight Q, which is applied to the circumference of the axle; let it be required to assign the proportion of the radii of the wheel and axle, so that the time in which the weight Q ascends through any given space shall be the least possible. In this case, supposing the radius of the wheel to be 10 inches, and its weight 20 ounces; let the radius of the axle $SA = 1$ inch, the weight to be raised thro' any given space to be 100 ounces, the moving force by which it is raised to be 33 ounces; then the distance of the centre of gyration from the axis is $\sqrt{50}$ inches; and the length of the radius sought is 9.55 inches.—If, instead of raising the weight perpendicularly, it be required to draw it horizontally, and to assign the distance SD, at which, if a given force P be applied, the time of describing a given space shall be the least, and the moment of q the greatest possible, we have the following conclusion. "Let the quantity of matter to be drawn along the plane be four times greater than that which is contained in the moving

(c) This he had formerly proved when treating of pendulums.

(d) l is here put for 193 inches, the supposed velocity of the weight P.

(e) R is the centre of gyration of the wheel.

* See Pendulum.

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On the
wheel-
axle.
Plate
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ving force; the radius of the axle SA being given; in order that it may be impelled with the greatest velocity possible and with the greatest moment, the radius of the wheel should be double that of the axle when the inertia of the wheel is not considered.

5. Let ARCH (fig. 117.) be a system of bodies moveable round a vertical axis which passes through the common centre of gravity of the system. Suppose DEG to be a wheel, the axis of which is vertical, and coincident with that of the system; let motion be communicated by means of a line going round this wheel, the string DP being stretched by a given weight P; let it be required to assign the radius of the wheel EGD, so that the angular velocity communicated to the system may be the greatest possible. Here, supposing the moving force to be one-fourth of the weight of the system, it should be applied at a distance from the axis equal to twice the distance of the centre of gyration, in order to produce the greatest possible angular velocity in a given time.

"In order (says Mr Atwood) to increase the action of a moving force against a weight to be raised, or resistance to be overcome, a combination of two or more mechanic powers is frequently made use of. Let p (fig. 118.) be a power applied by means of a line to the vertical wheel C: suppose the circumference of the axle K to be in contact with the circumference of any other vertical wheel B; so that the circumference of the wheel B may always move equally fast with that of the axle which belongs to C; let also the axle of B communicate motion to a vertical wheel A, to the axle of which a weight q is suspended, so as to act in opposition to p ; moreover, let the ratio of lmn to 1 be the sum of the ratios of the radius of each wheel to that of its axle: then, if $plmn = q$, the two weights p and q will sustain each other in equilibrio; but if $plmn$ be at all greater than q , the equilibrium will be destroyed;" and our author gives a method of calculating the quantity of motion communicated in certain circumstances.

Our author next goes through a set of similar propositions relating to the pulley and wedge; after which he treats of the accumulation of power in ponderous cylinders, and the use of balast-wheels in machines, of which mention has already been made; and having discussed these subjects, he next comes to treat of the action of a stream of water upon a wheel revolving round an horizontal axis.

6. Let ABC (fig. 119.) represent a water-wheel which revolves round an horizontal fixed axis, passing through its centre S. Suppose DEF to be the axle of this wheel, and that a weight W is affixed to a line DW, so wound round the axle, that while the wheel is driven round its own plane by the force of the water impinging at I, the weight W may be raised in a vertical line: having given the area of the boards II, against which the stream impinges perpendicularly, and the altitude from which the water descends, it is required to assign the greatest velocity with which the wheel can revolve.

"When a stream of any fluid (says he) impinges perpendicularly against a plain and quiescent surface, the exact quantity of the moving force is equal to the weight of a column of the fluid, the base of which is the area upon which the fluid impinges, and the alti-

tude that from which a body must descend freely from rest by gravity, in order to acquire that velocity. This will be the moving force which impels the body when quiescent or just beginning to move: but after it has acquired some motion, the impulsive force of the body will be diminished; being the same as if the body were quiescent, and the water impinged upon it with the difference of the former velocities. Wherefore the altitude of the column of the fluid, which is equal to its impelling force, will be always as the difference between the velocity of the impact and that of the body itself; and since the altitudes from which bodies fall from rest are in a duplicate ratio of the velocities acquired, it follows, that the force of the impact will be in a duplicate ratio of the difference between the velocity of the wheel and that of the impact." The following is the conclusion drawn by Mr Atwood concerning the velocity: Putting A for the weight of the column of water when the wheel is quiescent; V the velocity with which it impinges on the boards II, &c. and y the velocity of the circumference sought; W the weight of the wheel; then $y = V - V \times \sqrt{\frac{W \cdot SD}{A \times SI}}$.

7. Every other thing remaining the same, let the weight W be varied; and let it be required to assign the weight W, so that when the wheel has acquired its uniform velocity, the moment of W may be the greatest possible. Here the weight $= \frac{4A \times SI}{9SD}$.

8. Having given a weight W to be raised by the action of the stream of water, the force of which is $= A$ against a quiescent surface; let it be required to assign what must be the proportion between the radius of the wheel and that of the axle; so that the uniform velocity of the ascending weight may be the greatest possible. Here the length of the radius $= \frac{9W \times SD}{4A}$. Hence he concludes, that if the velocity with which the water impinges against the boards be doubled, the greatest moment communicated to a weight ascending uniformly, will be increased in the proportion of 8 to 1.

"The force (says Mr Atwood) which communicates motion to water-wheels, and the resistances which are occasioned by friction, tenacity, and various other causes, render the application of the theory of mechanics to practice, in these cases, extremely difficult. It is probably from this reason, that the construction of machines moved by the force of water, &c. has been almost wholly practical, the best improvements having been deduced from continued observation of the results produced in given circumstances; whereby the gradual correction of error, and varied experience of what is most effectual, have supplied the place of a more perfect investigation from the laws of motion.

"This seems to be the best method, as far as regards the practical construction of these machines, the nature of the case will admit of; for although there may be two ways leading ultimately to the same truths, *i. e.* a direct investigation from the laws of motion and long continued observation, independent of theory, the latter is frequently the most easy and intelligible, although less direct and less scientific; the former being inaccessible to those who possess the elementary

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tions on
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mentary parts of mechanics only. It is in vain to attempt the application of the theory of mechanics to the motion of bodies, except every cause which can sensibly influence the moving power and the resistance to motion be taken into account: if any of these be omitted, error and inconsistency in the conclusions deduced must be the consequence. It was at one time supposed, from this inadequate application of the theory, that the same laws of motion would not extend to all branches of mechanics, but that different principles were to be accommodated to different kinds of motion. If this were truly the case, the science of mechanics would fall short of that superior excellence and extent which it is generally allowed to possess. For it is probable, that there is no kind of motion but what may be referred to three easy and obvious propositions, the truth of which it is impossible to doubt: and if we are not enabled to investigate the effects from the data in all cases, the deficiency must not be imputed to the science of mechanics, but to the want of methods of applying mathematics to it.

"This may be illustrated by an example, in order to show that the motion communicated to water-wheels, however complicated the data may be, is equally referable to the laws of motion, with the effects of the most uncompounded force. If a stream of water falls perpendicularly on a plain surface, the moving force arising from the impact only is equal to the weight of a column of water, the base of which is the surface upon which the water impinges, and altitude that through which a body must fall to acquire the velocity of impact. If the inclination of the stream to the surface should be changed, the force exerted in a direction perpendicular to the plane will be diminished in a duplicate ratio of the radius to the sine of inclination; the surface on which the water impinges remaining. Now, when the water falls on the boards of a water-wheel, the direction of the stream makes different angles with the planes of those boards; for since the particles of water descend in curve lines, they will strike any plain surface in the direction of a tangent to the curve on the point of impact. Moreover, the water will strike the higher boards TT with less velocity, and in a direction more inclined to their planes, than the lower ones II; it is also to be considered, that the stream will impinge on the boards at different distances from the axis of motion: all which circumstances must be taken into account, to find the force which tends to communicate motion to the wheel when quiescent; and when motion has been communicated, the force of the stream to turn the wheel will be determined in the manner already mentioned. But this is not the only consideration which affects the moving force: The force hitherto considered has been supposed to proceed from the impact of the particles only; in which case, each particle after it has struck the board is imagined to be of no other effect in communicating motion: but this is not wholly the case; for after the particle has impinged on the board, it will continue some time to operate by its weight; and this time will be longer or shorter according to the different constructions of the wheel. In the overshot wheel, the continuance of the pressure, arising from the weight of the water, will be longer than in the undershot,

Fig. 119.

the force which arises from the impact of the water being nearly the same in each case. The whole moving force, therefore, will consist of the impact determinable as above, and of the weight of the water descending along with the circumference, and communicating additional motion to it: this entire moving force being determined either by theory or experience, may be denoted by A. After the moving force which impels the circumference has been determined, the resistance to this force must be found; for on the proportion between the moving force and the resistance, the acceleration of the machine will depend. This resistance is of various kinds: 1. That of inertia. 2. If the machine is of that kind which raises weights, such for instance as water; the weight raised, allowing for its mechanical effect on the point of which we desire to know the acceleration, must be subducted from the moving force before found; and this will be a constant quantity. There are other resistances also homogeneous to weight, viz. those of friction and tenacity, &c. which are variable in some ratio of the machine's velocity: and in order to proceed with the investigation, the exact quantity of weight which the friction is equal to, when the wheel moves with a given velocity, must be considered, as well as the variation of the resistances in respect to the velocities; which circumstances must be determined by experiment. If the force equivalent to the friction, &c. be subducted from the moving force, the remainder will give the moving power, by which the circumference is impelled upon the whole: this being divided by the inertia of the mass moved, will give the force which accelerates the circumference.

The following apparatus has been invented by Mr Atwood, for illustrating his doctrines concerning accelerated motion, and has been found to answer the purpose more completely than any other we have heard of; discovering at once the quantity of matter moved, the force which moves it, the space described from rest, the time of description, and the velocity acquired.

1. *Of the mass moved.*—In order to observe the effects of the moving force, which is the object of any experiment, the interference of all other forces should be prevented: the quantity of matter moved, therefore, considering it before any impelling force has been applied, should be without weight; for although it be impossible to abstract the natural gravity or weight from any substance whatever, yet the weight may be so counteracted as to be of no sensible effect in experiments. Thus in the instrument constructed to illustrate this subject experimentally, A, B, fig. 120. represent two equal weights affixed to the extremities of a very fine and flexible silk line: this line is stretched over a wheel or fixed pulley *abcd*, moveable round an horizontal axis: the two weights A, B, being precisely equal and acting against each other, remain in equilibrio; and when the least weight is superadded to either (setting aside the effects of friction), it will preponderate. When AB are set in motion by the action of any weight *m*, the sum $A + B + m$ would constitute the whole mass moved, but for the inertia of the materials which must necessarily be used in the communication of motion: these materials consist of,

1. The

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His apparatus
for experiments
on motion.

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1. The wheel *abcd*, over which the line sustaining A and B passes. 2. The four friction wheels on which the axle of the wheel *abcd* rests: the use of these wheels is to prevent the loss of motion, which would be occasioned by the friction of the axle if it revolved on an immoveable surface. 3. The line by which the bodies A and B are connected, so as when set in motion to move with equal velocities. The weight and inertia of the line are too small to have sensible effect on the experiments; but the inertia of the other materials just mentioned constitute a considerable proportion of the mass moved, and must be taken into account. Since when A and B are put in motion, they must necessarily move with a velocity equal to that of the circumference of the wheel *abcd* to which the line is applied; it follows, that if the whole mass of the wheels were accumulated in this circumference, its inertia would be truly estimated by the quantity of matter moved; but since the parts of the wheels move with different velocities, their effects in resisting the communication of motion to A and B by their inertia will be different; those parts which are furthest from the axis resisting more than those which revolve nearer in a duplicate proportion of those distances. If the figures of the wheels were regular, from knowing their weights and figures, the distances of their centres of gyration from their axes of motion would become known, and consequently an equivalent weight, which being accumulated uniformly in the circumference *abcd*, would exert an inertia equal to that of the wheels in their constructed form. But as the figures are wholly irregular, recourse must be had to experiment, to assign that equivalent quantity of matter, which being accumulated uniformly in the circumference of the wheel *abcd*, would resist the communication of motion to A in the same manner as the wheels.

In order to ascertain the inertia of the wheel *abcd*, with that of the friction wheels, the weights AB being removed, the following experiment was made.

A weight of 30 grains was affixed to a silk line (the weight of which was not so much as $\frac{1}{4}$ th of a grain, and consequently too inconsiderable to have sensible effect in the experiment); this line being wove round the wheel *abcd*, the weight 30 grains by descending from rest communicated motion to the wheel, and by many trials was observed to describe a space of about $38\frac{1}{2}$ inches in 3 seconds. From these data the equivalent mass or inertia of the wheels will be known from this rule:

Let a weight P (fig. 121.) be applied to communicate motion to a system of bodies by means of a very slender and flexible line going round the wheel SLDIM, through the centre of which the axis passes (G being the common centre of gravity, R the centre of gravity of the matter contained in this line, and O the centre of oscillation). Let this weight descend from rest through any convenient space *s* inches, and let the observed time of its descent be *t* seconds; then if *l* be the space through which bodies descend freely by gravity in one second, the equivalent weight sought = $\frac{W \times SR \times SO}{SD^2} = \frac{P \times t^2}{l^2} - P$.

Here we have $p = 30$ grains, $t = 3$ seconds, $l = 193$

inches, $s = 38.5$ inches; and $\frac{P \times t^2}{l^2} - P = \frac{30 \times 9 \times 193}{385} = 1323$ grains, or $2\frac{1}{4}$ ounces.

This is the inertia equivalent to that of the wheel *abcd*, and the friction wheels together: for the rule extends to the estimation of the inertia of the mass contained in all the wheels.

The resistance to motion therefore arising from the wheel's inertia, will be the same as if they were absolutely removed, and a mass of $2\frac{1}{4}$ ounces were uniformly accumulated in the circumference of the wheel *abcd*. This being premised, let the boxes A and B be replaced, being suspended by the silk line over the wheel or pulley *abcd*, and balancing each other: suppose that any weight *m* be added to A so that it shall descend, the exact quantity of matter moved, during the descent of the weight A, will be ascertained, for the whole mass will be $A + B + m + 2\frac{1}{4}$ oz. Fig. 120.

In order to avoid troublesome computations in adjusting the quantities of matter moved and the moving forces, some determinate weight of convenient magnitude may be assumed as a standard, to which all the others are referred. This standard weight in the subsequent experiments is $\frac{1}{4}$ of an ounce, and is represented by the letter *m*. The inertia of the wheels being therefore $= 2\frac{1}{4}$ ounces, will be denoted by $11m$. A and B are two boxes constructed so as to contain different quantities of matter, according as the experiment may require them to be varied: the weight of each box, including the hook to which it is suspended, $= 1\frac{1}{2}$ oz. or according to the preceding estimation, the weight of each box will be denoted by $6m$; these boxes contain such weights as are represented by fig. 122. each of which weighs an ounce, so as to be equivalent to $4m$; other weights of $\frac{1}{2}$ oz. $= 2m$, $\frac{1}{4}$ $= m$, and aliquot parts of *m*, such as $\frac{1}{2}m$, $\frac{1}{4}m$, may be also included in the boxes, according to the conditions of the different experiments hereafter described.

If $4\frac{1}{2}$ oz. or $19m$, be included in either box, this with the weight of the box itself will be $25m$; so that when the weights A and B, each being $25m$, are balanced in the manner above represented, their whole mass will be $50m$, which being added to the inertia of the wheels $11m$, the sum will be $61m$. Moreover, three circular weights, such as that which is represented at fig. 123. are constructed; each of which $= \frac{1}{4}$ oz. or m : if one of these be added to A and one to B, the whole mass will now become $63m$, perfectly in equilibrio, and moveable by the least weight added to either (setting aside the effects of friction), in the same manner precisely as if the same weight or force were applied to communicate motion to the mass $63m$, existing in free space and without gravity.

2. The moving Force. Since the natural weight or gravity of any given substance is constant, and the exact quantity of it easily estimated, it will be convenient here to apply a weight to the mass A as a moving force: thus, when the system consists of a mass $= 63m$, according to the preceding description, the whole being perfectly balanced, let a weight $\frac{1}{4}$ oz. or *m*, such as is represented in fig. 124. be applied on the mass A; this will communicate motion to the whole system: by adding a quantity of matter *m* to the former mass $63m$, the whole quantity of matter moved will now become

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become $64m$; and the moving force being $=m$, this will give the force which accelerates the descent of A $=\frac{m}{64m}$, or $\frac{1}{64}$ part of the accelerating force by which the bodies descend freely towards the earth's surface.

By the preceding construction, the moving force may be altered without altering the mass moved; for suppose the three weights m , two of which are placed on A, and one on B to be removed, then will A balance B. If the weights $3m$ be all placed on A, the moving force will now become $3m$, and the mass moved $64m$ as before, and the force which accelerates the descent of A $=\frac{3m}{64m}=\frac{3}{64}$ parts of the force by which gravity accelerates bodies in their free descent to the surface.

Suppose it were required to make the moving force $2m$, the mass moved continuing the same. In order to effect this, let the three weights, each of which $=m$, be removed; A and B will balance each other; and the whole mass will be $61m$: let $\frac{1}{2}m$, fig. 124. be added to A, and $\frac{1}{2}m$ to B, the equilibrium will still be preserved, and the mass moved will be $62m$; now let $2m$ be added to A, the moving force will be $2m$, and the mass moved $64m$, as before; wherefore the force of acceleration $=\frac{1}{32}$ part of the acceleration of gravity. These alterations in the moving force may be made with great ease and convenience in the more obvious and elementary experiments, there being no necessity for altering the contents of the boxes A and B: but the proportion and absolute quantities of the moving force and mass moved may be of any assigned magnitude, according to the conditions of the proposition to be illustrated.

3. *Of the space described.* The body A, fig. 120, descends in a vertical line; and a scale about 64 inches in length graduated into inches and tenths of an inch is adjusted vertical, and so placed that the descending weight A may fall in the middle of a square stage, fixed to receive it at the end of the descent: the beginning of the descent is estimated from o on the scale, when the bottom of the box A is on a level with o. The descent of A is terminated when the bottom of the box strikes the stage, which may be fixed at different distances from the point o; so that by altering the position of the stage, the space described from quiescence may be of any given magnitude less than 64 inches.

4. *The time of motion* is observed by the beats of a pendulum, which vibrates seconds; and the experiments, intended to illustrate the elementary propositions, may be easily so constructed that the time of motion shall be a whole number of seconds: the estimation of the time, therefore, admits of considerable exactness, provided the observer takes care to let the bottom of the box A begin its descent precisely at any beat of the pendulum; then the coincidence of the stroke of the box against the stage, and the beat of the pendulum at the end of the time of motion, will show how nearly the experiment and the theory agree together. There might be various mechanical devices thought of for letting the weight A begin its descent at the instant of a beat of the pendulum W; let the bottom of the box A, when at o on the scale, rest on a flat rod, held in the hand horizontally, its

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extremity being coincident with o, by attending to the beats of the pendulum; and with a little practice, the rod which supports the box A may be removed at the moment the pendulum beats, so that the descent of A shall commence at the same instant.

4. *Of the velocity acquired.* It remains only to describe in what manner the velocity acquired by the descending weight A, at any given point of the space through which it has descended, is made evident to the senses. The velocity of A's descent being continually accelerated will be the same in no two points of the space described. This is occasioned by the constant action of the moving force; and since the velocity of A at any instant is measured by the space which would be described by it, moving uniformly for a given time with the velocity it had acquired at that instant, this measure cannot be experimentally obtained, except by removing the force by which the descending body's acceleration was caused.

In order to show in what manner this is affected particularly, let us again suppose the boxes A and B $=25m$ each, so as together to be $=50m$; this with the wheel's inertia $11m$ will make $61m$; now let m , fig. 122, be added to A, and an equal weight m to B, these bodies will balance each other, and the whole mass will be $63m$. If a weight m be added to A, motion will be communicated, the moving force being m , and the mass moved $64m$. In estimating the moving force, the circular weight $=m$ was made use of as a moving force: but for the present purpose of showing the velocity acquired, it will be convenient to use a flat rod, the weight of which is also $=m$. Let the bottom of the box A be placed on a level with o on the scale, the whole mass being as described above $=63m$, perfectly balanced in equilibrio. Now let the rod, the weight of which $=m$, be placed on the upper surface of A; this body will descend along the scale precisely in the same manner as when the moving force was applied in the form of a circular weight. Suppose the mass A, fig. 125, to have descended by constant acceleration of force of m , for any given time, or through a given space: let a circular frame be so affixed to the scale, contiguous to which the weight descends, that A may pass centrally through it, and that this circular frame may intercept the rod m by which the body A has been accelerated from quiescence. After the moving force m has been intercepted at the end of the given space or time, there will be no force operating on any part of the system which can accelerate or retard its motion: this being the case, the weight A, the instant after m has been removed, must proceed uniformly with the velocity which it had acquired that instant: in the subsequent part of its descent, the velocity being uniform will be measured by space described in any convenient number of seconds.

Other uses of the instrument. It is needless to describe particularly, but it may not be improper just to mention the further uses of this instrument; such as the experimental estimation of the velocities communicated by the impact of bodies elastic and nonelastic; the quantity of resistance opposed by fluids, as well as for various other purposes. These uses we shall not insist on; but the properties of retarded motion being a part of the present subject, it may be necessary to show

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Fig. 118.

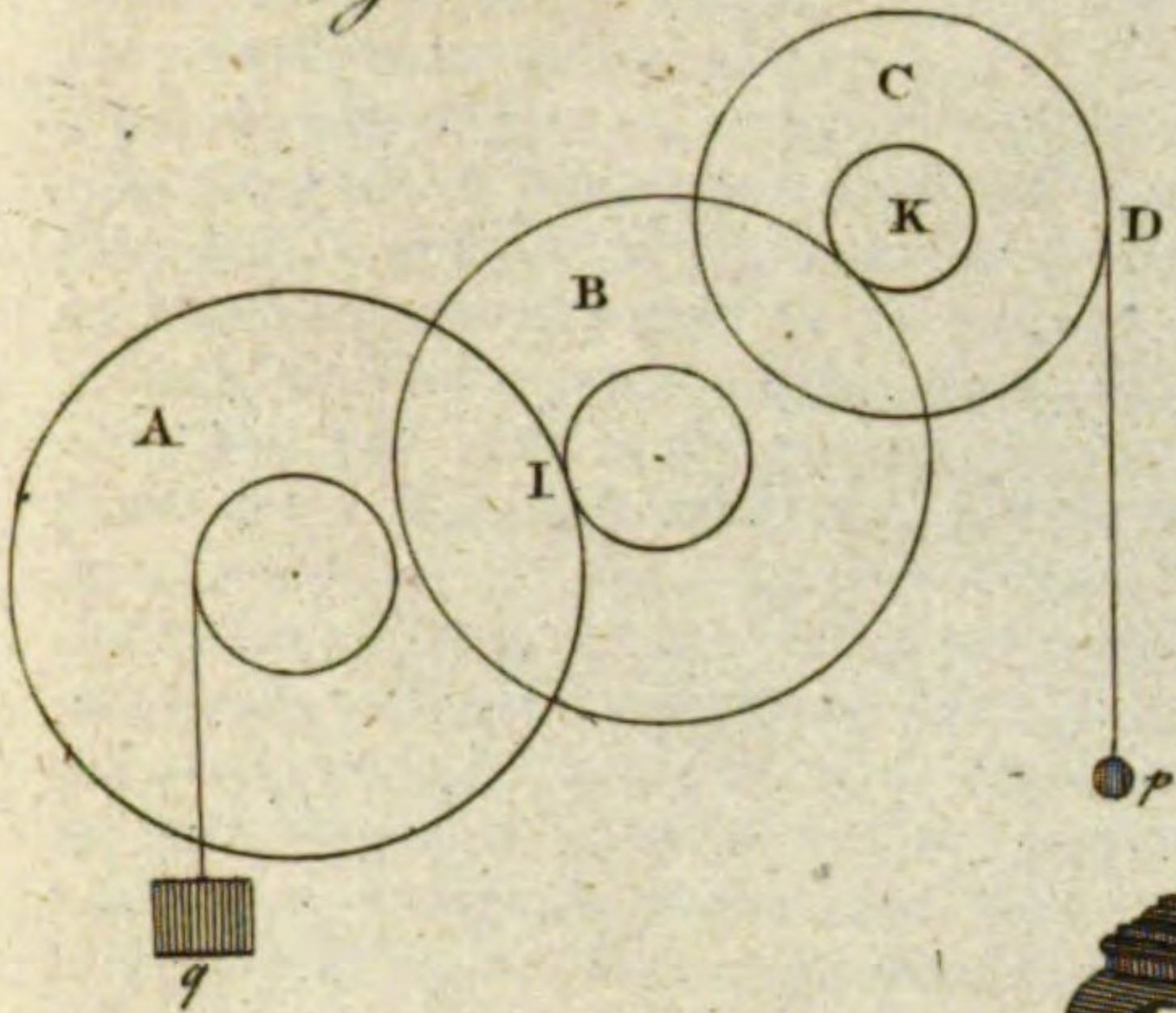


Fig. 125.

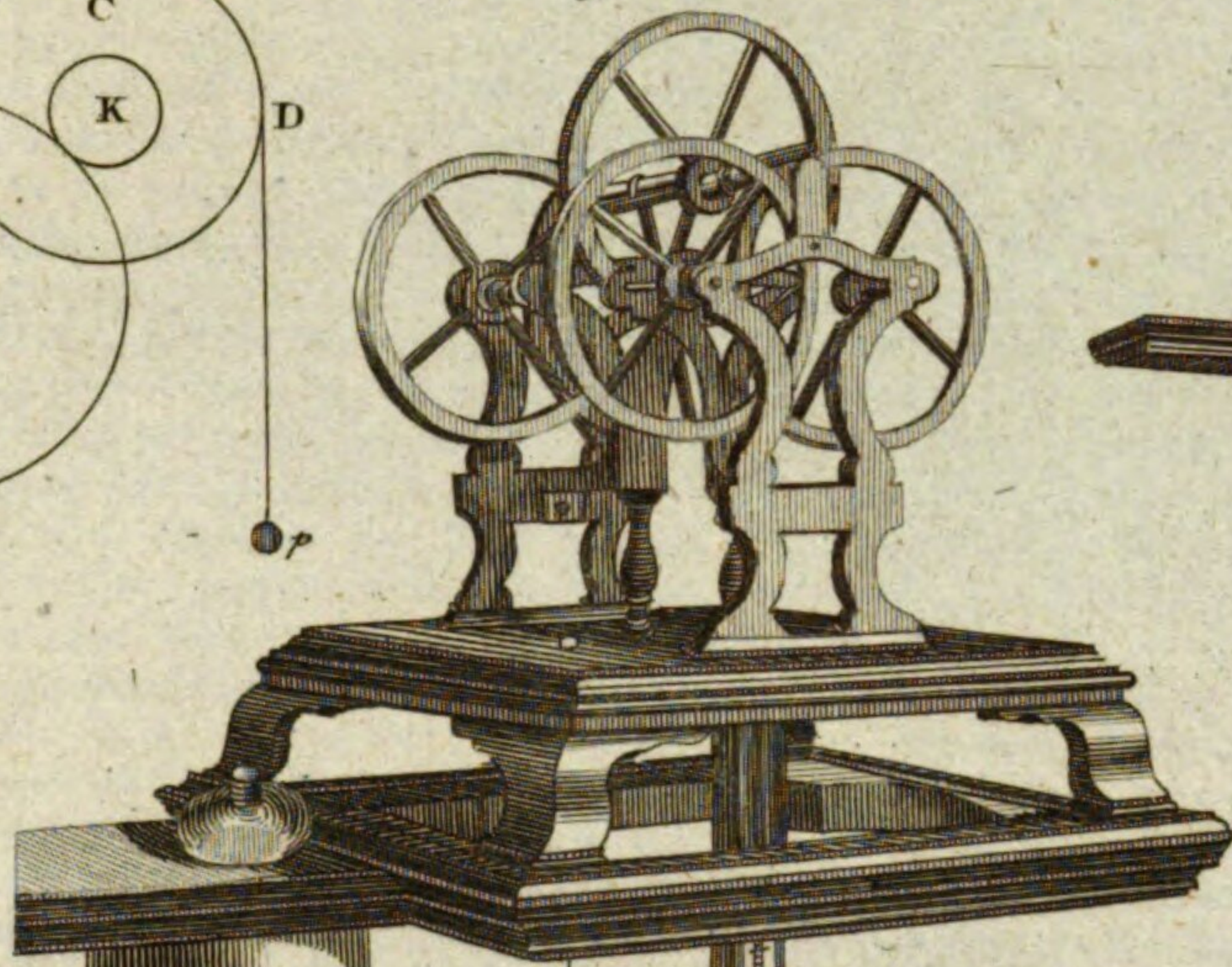


Fig. 120.

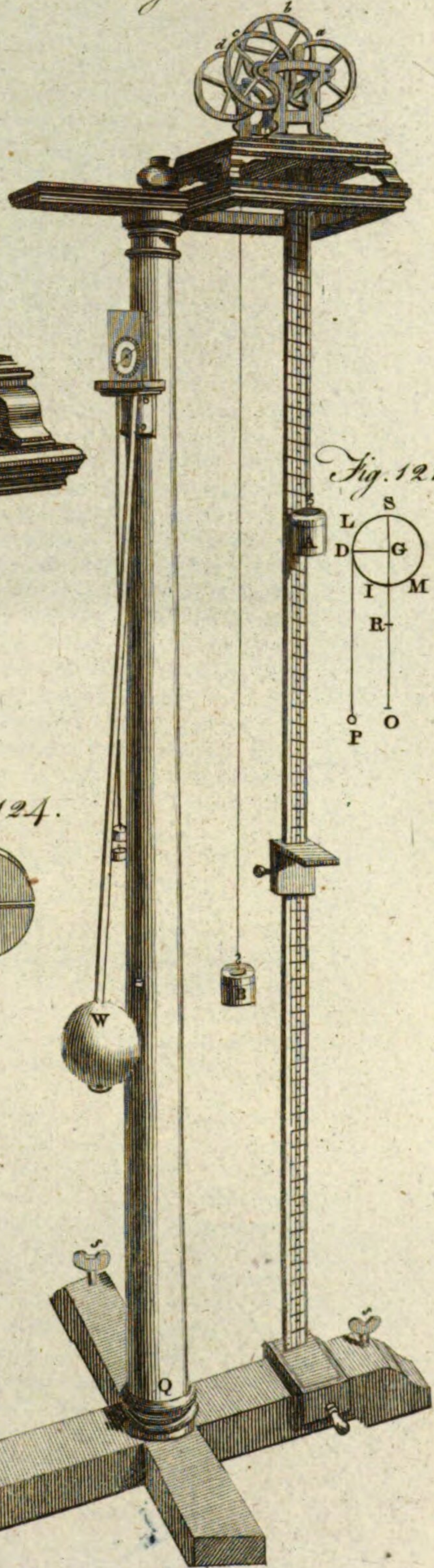


Fig. 119.

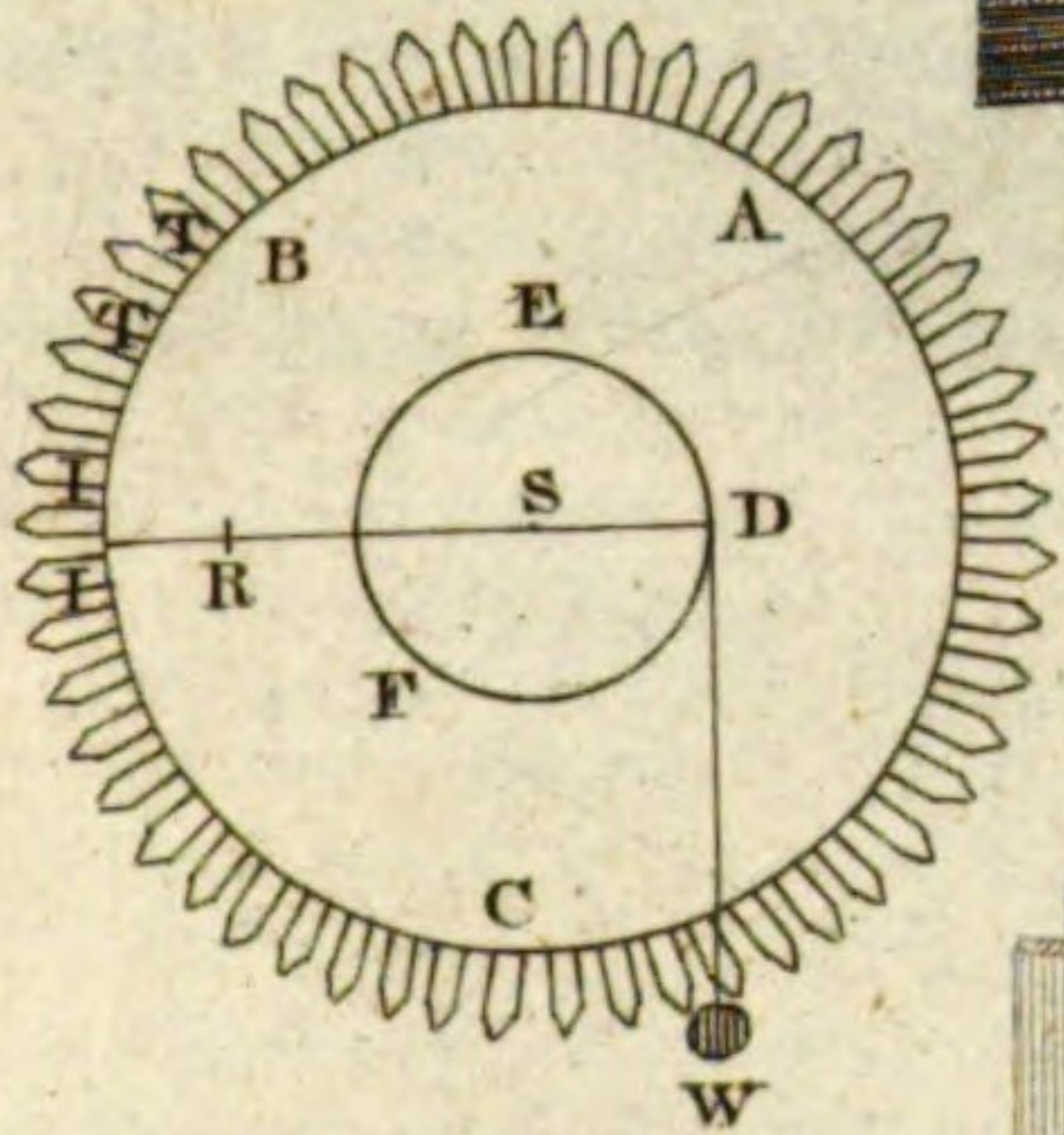


Fig. 121.

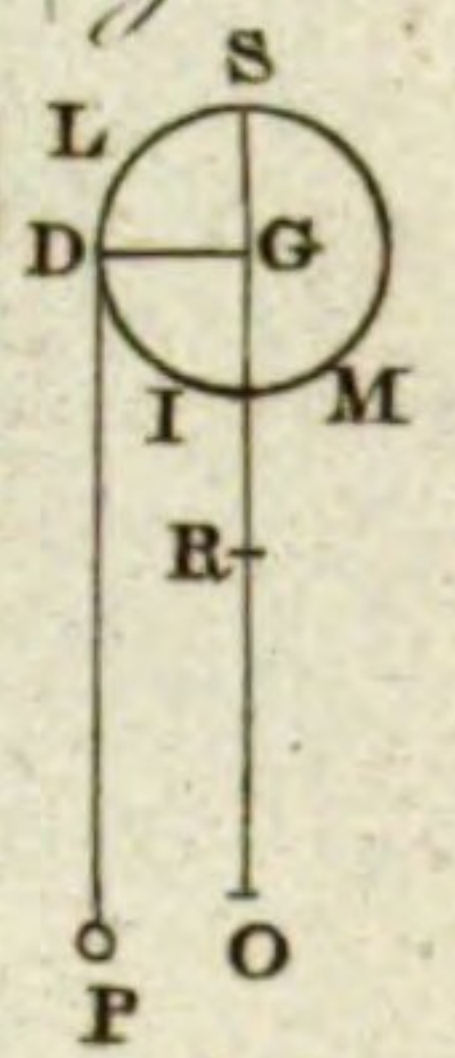


Fig. 122.

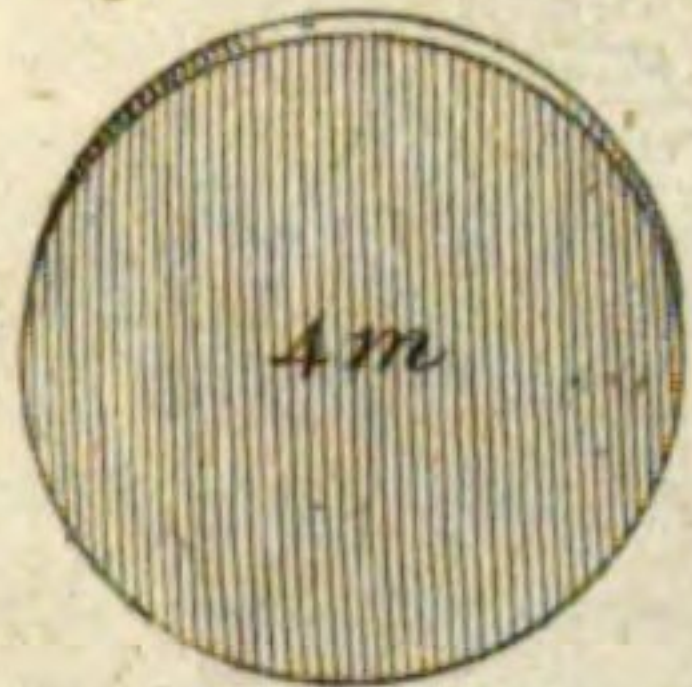


Fig. 124.

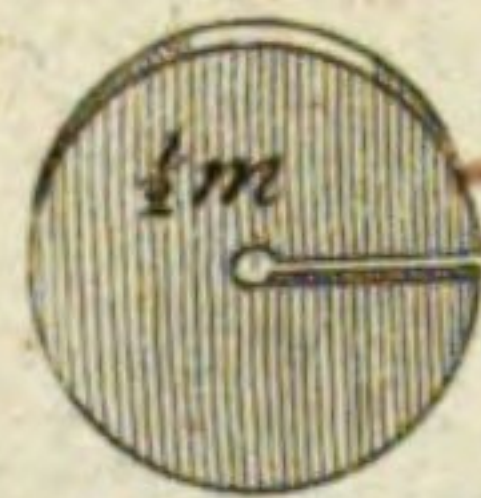


Fig. 117.

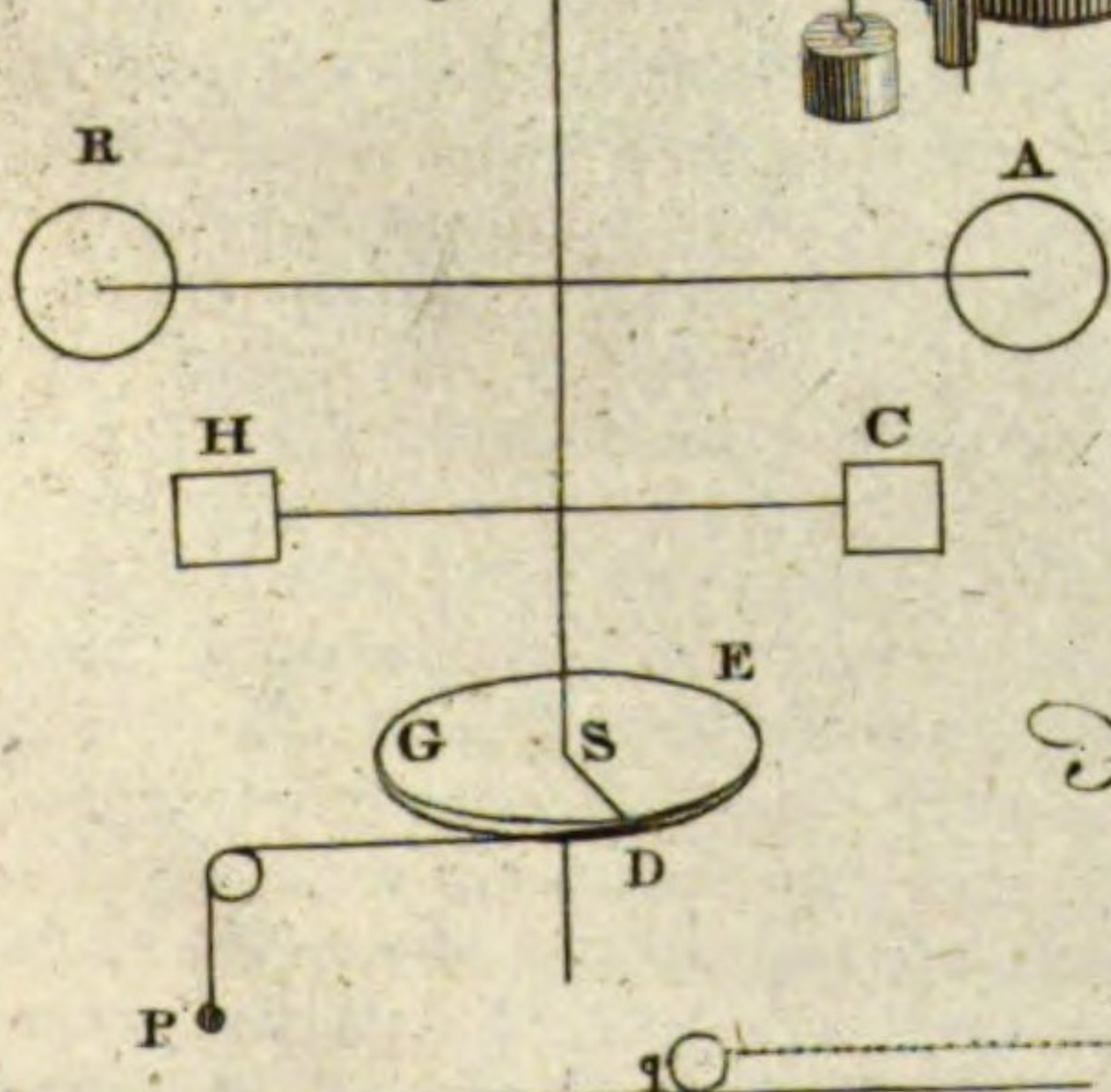


Fig. 123.

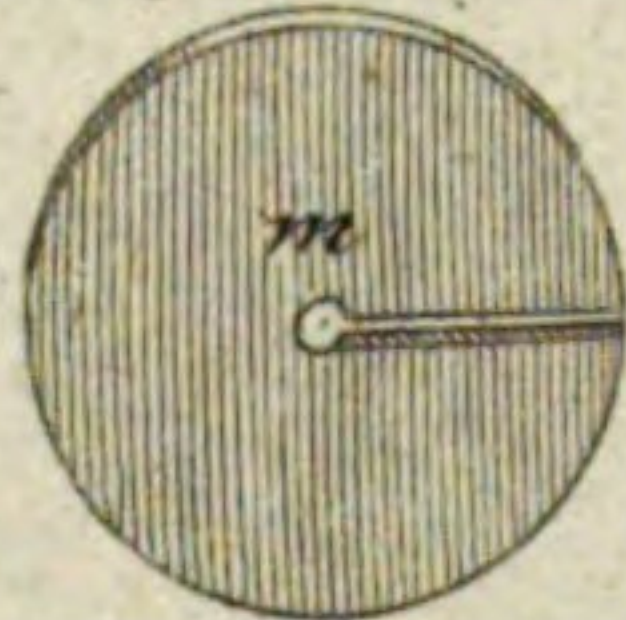
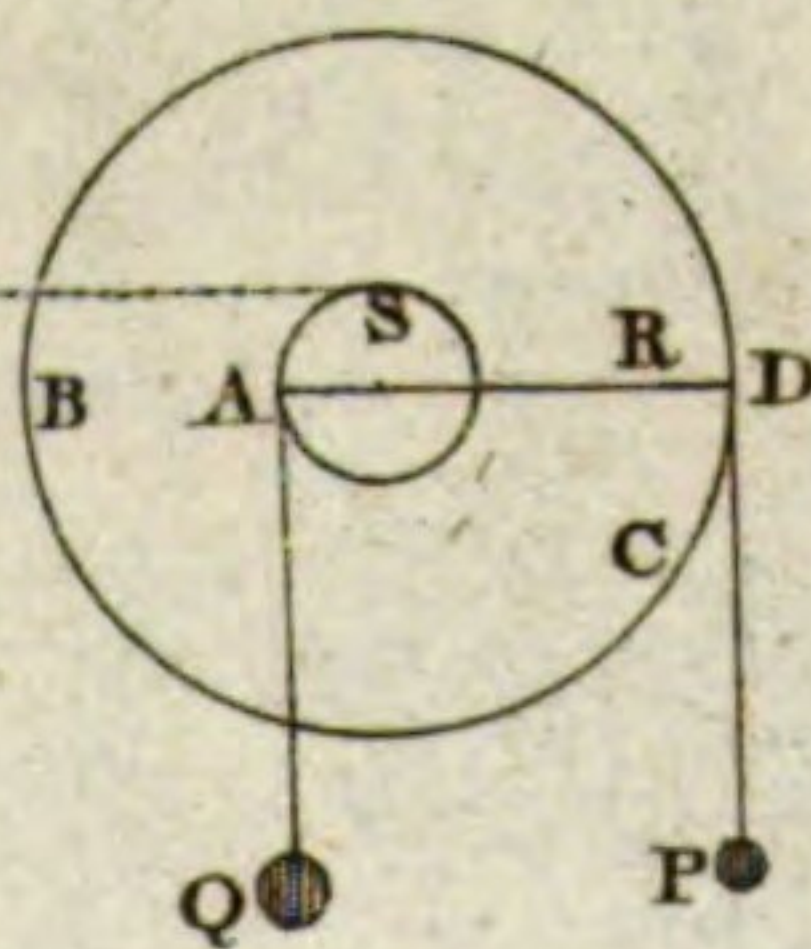


Fig. 116.



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in what manner the motion of bodies resisted by constant forces are reduced to experiment by means of the instrument above described, with as great ease and precision as the properties of bodies uniformly accelerated. A single instance will be sufficient: Thus, suppose the mass contained in the weights A and B, fig. 125. and the wheels to be $61m$, when perfectly in equilibrio; let a circular weight m be applied to B, and let two long weights or rods, each $=m$, be applied to A, then will A descend by the action of the moving force m , the mass moved being $64m$: suppose that when it has described any given space by constant acceleration, the two rods m are intercepted by the circular frame above described, while A is descending through it, the velocity acquired by that descent is known; and when the two rods are intercepted, the weight A will begin to move on with the velocity acquired, being now retarded by the constant force m ; and since the mass moved is $62m$, it follows, that the force of retardation will be $\frac{1}{62}$ part of that force whereby gravity retards bodies thrown perpendicularly upwards. The weight A will therefore proceed along the graduated scale in its descent with an uniformly retarded motion, and the spaces described, times of motion, and velocities destroyed by the resisting force, will be subject to the same measures as in the examples of accelerated motion above described.

In the foregoing descriptions, two suppositions have been assumed, neither of which are mathematically true: but it may be easily shown that that are so in a physical sense; the errors occasioned by them in practice being insensible.

1. The force which communicates motion to the system has been assumed constant; which will be true only on a supposition that the line, at the extremities of which the weights A and B, fig. 120. are affixed, is without weight. In order to make it evident, that the line's weight and inertia are of no sensible effect,

let a case be referred to, wherein the body A descends through 48 inches from rest by the action of the moving force m , when the mass moved is $64m$; the time wherein A describes 48 inches is increased by the effects of the line's weight by no more than $\frac{3}{10000}$ th parts of a second; the time of descent being 3.9896 seconds, when the string's weight is not considered; and the time when the string's weight is taken into account $= 4.0208$ seconds; the difference between which is wholly insensible by observation.

2. The bodies have also been supposed to move in vacuo, whereas the air's resistance will have some effect in retarding their motion: but as the greatest velocity communicated in these experiments, cannot much exceed that of about 26 inches in a second (suppose the limit 26.2845), and the cylindrical boxes being about $1\frac{1}{2}$ inches in diameter, the air's resistance can never increase the time of descent in so great a proportion as that of 240 : 241; its effects therefore will be insensible in experiment.

The effects of friction are almost wholly removed by the friction wheels; for when the surfaces are well polished and free from dust, &c. if the weights A and B be balanced in perfect equilibrio, and the whole mass consists of $63m$, according to the example already described, a weight of $\frac{1}{2}$ grains, or at most 2 grains, being added either to A or B, will communicate motion to the whole; which shows that the effects of friction will not be so great as a weight of $1\frac{1}{2}$ or 2 grains. In some cases, however, especially in experiments relating to retarded motion, the effects of friction become sensible; but may be very readily and exactly removed by adding a small weight 1.5 or 2 grains to the descending body, taking that the weight added is such as is in the least degree smaller than that which is just sufficient to set the whole in motion, when A and B are equal and balance each other before the moving force is applied.

M E C

M E C

MECHOACAN, a province of Mexico, or New Spain, in America, bounded on the north by Panuco and Gaudalajara, on the east by Panucs and Mexico Proper, on the south by the Pacific Ocean, and on the west by Guadalajara and the South Sea. The soil is exceedingly fertile; and the climate so wholesome, that the Spaniards imagine it to be possessed of some peculiarly restorative quality; for which reason the sick and infirm flock to it from all quarters. The commodities are sulphur, indigo, sarsaparilla, saffras, cacao, vanilloes, ambergrise, hides, wool, cotton, silk, sugar, the root mechoacan or white jalap, and silver. This province formed an independent kingdom at the time Mexico was reduced by Cortez. The sovereign had long been the inveterate enemy of the Mexicans, and was considered, next to the republic of Tlascala, as the most formidable barrier against the extension of the imperial frontier. However, he submitted to Cortez without striking a blow, being intimidated by the wonders he had performed with a handful of men; and thus Mechoacan became a province of the Spanish empire, and a valuable addition to Mexico.

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The country at that time was exceedingly populous, but the natives are now much thinned; and that rather by the luxury and effeminacy introduced by the Spaniards, than by their tyranny. The capital of the province is also called *Mechoacan* by the natives, but *Valladolid* by the Spaniards.

MECHOACAN, or *White Jalap*, in the materia medica, the root of an American species of convolvulus brought from Mechoacan, a province of Mexico, in thin slices like jalap, but larger, and of a whitish colour. It was first introduced into Europe about the year 1524, as a purgative universally safe, and capable of evacuating all morbid humours from the most remote parts of the body: but as soon as jalap became known, mechoacan gradually lost its reputation, which it has never since been able to retrieve. It is nevertheless by some still deemed an useful cathartic; it has very little smell or taste, and is not apt to offend the stomach; its operation is slow, but effectual and safe. Geoffroy affirms, that there is scarce any purgative accompanied with fewer inconveniences. It seems to differ from jalap only in being weaker; the

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refus-

Mecklen-
burg.

resins obtained from both have nearly the same qualities, but jalap yields five or six times as much as mechoacan; hence it is found necessary to exhibit the latter in six times the dose of the former to produce the same effects.

MECKLENBURG, a duchy of Germany, containing those of Schwerin and Gustro, is bounded by Pomerania on the east, by part of the marquisate of Brandenburg and the duchy of Lunenburg on the south, the Baltic on the north, and Holstein and Saxe-Lawenburg on the west. Their greatest length is about 120 miles, and greatest breadth upwards of 60. With respect to the soil, much cannot be said in favour of it, as it consists in general, either of sand, or large and desolate heaths, interspersed with moors, woods, fens, and lakes. It yields very little wheat, and not a great deal of oats, rye, and barley; but breeds a considerable number of sheep and cattle, has plenty of fish, with stone-quarries, salt-springs, alum, iron, and some copper. The principal rivers here are the Elde and Stor, which fall into the Elbe as it glides along the borders of this country to the south-west; the Reckenitz, which discharges itself into the Baltic; as do the Peene, the Warno, and the Stopenitz. This country has only one harbour on the Baltic, namely that of Rostock. In both duchies, exclusive of Rostock, are 45 great and small cities, with three convents, and a great number of manors and farms, belonging either to the duke, the nobility, or convents. The peasants are in a state of villinage; but the nobility enjoy very considerable privileges. The states are composed of the nobility and towns; and the diets, which are summoned annually, are held alternately at Sternberg and Malehin. The duchy of Schwerin appoints four provincial counsellors, and that of Gustro as many; who rank, according to seniority with the duke's actual privy-counsellors, as their marshals do with the colonels. The lesser committee represents the whole body of the nobility and commons, by whom the members are chosen freely and without controul, and no edict relative to the whole country can be published without their consent, or in prejudice of their rights. The inhabitants of this country are mostly Lutherans, under their superintendants. There are also some Calvinists and Roman Catholics. Besides the grammar-schools in the towns, there is an university at Rostock. The commodities of the duchy are corn, flax, hemp, hops, wax, honey, cattle, butter, cheese, wool, and wood, a part of which is exported, but hardly any manufactures.

Of the house of Mecklenburg, there are two lines

still subsisting, viz. that of Schwerin and that of Strelitz. The latter commenced in duke Adolphus Frederick II. younger brother of the duke of Schwerin, and grandfather of the present duke of Strelitz, Adolphus Frederick IV. who entered on the government in 1752, and whose family hath lately received a great additional lustre by his Britannic majesty's taking his second sister for his consort, and by her own great merit and noble deportment in that high station. Besides the duchy of Strelitz, to this duke belong the principality of Ratzeburg, with the lordship of Stargard, the ancient commanderies of Miro and Nemer, and a yearly pension of 9000 dollars out of the Boitzenburgh toll. The title assumed by both the dukes is *duke of Mecklenburg, prince of Wenden, Schwerin, and Ratzeburg, count of Schwerin and the country of Rostock, and lord of Stargard*. By the agreement concluded at Wittstock in 1442, the elector of Brandenburg, on the extinction of the male-line of the dukes of Mecklenburg, is entitled to their whole succession. The duke of Schwerin has two votes both in the diet of the empire and that of the circle. The matricular assessment for the duchies of Schwerin and Gustro is 40 horse and 67 foot, or 748 florins monthly, including what is paid by Sweden for Wismar, and the bailiwicks of Poll and Neukloster. To the chamber of Wetzlar, these two duchies pay each 243 rix-dollars, 43 kruitzers. For the government of Mecklenburg, the administration of justice, and the management of the revenue, there is the privy council of regency, the demesne-chamber, the high and provincial court of justice, to which appeals lie in most causes, both from the consistory and the inferior civil courts, and which are common to both the dukes. As to the revenues, those of the Schwerin line must be very considerable, those arising from the demesne-bailiwicks and regalia alone amounting to 300,000 rix-dollars per annum. There is a tax on land that produces no contemptible sum, and that called the *prince's tax* is fixed at 20,000 rix-dollars: besides all these, there are also free-gifts. The whole revenues of the Strelitz branch are estimated at 120,000 rix-dollars. Each of these princes maintains a body of troops.

MECONIUM, the excrement contained in the guts of an infant at its birth. If this matter is not soon purged off, it occasions gripes, &c. A tea-spoonful of true castor oil is an excellent purge in this case; but the first milk from the mother's breast is usually sufficient, if it flows in due time.

MECONIUM, in pharmacy, the extract of British poppies. It has all the virtues of foreign opium, but in a somewhat lower degree.

Mecklen-
burg,
Meconium.

END OF THE TENTH VOLUME.

DIRECTIONS FOR PLACING THE PLATES OF VOL. X.

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E R R A T A.

- Page 121. col. 1. line 30. For "*Lord Napier*, Baron of Merchiston," read "*John Napier*, Baron," &c. And for "*Lord Napier*," in different other places in the course of the article, read "*Baron Napier*." The same error has been fallen into by several former writers, when treating of the invention of Logarithms. *John*, above mentioned, the real author of that invention, was, according to the custom of Scotland in his time, called The Baron of Merchiston; *Baron* being an appellation then given to all the great landholders, but which did not confer or imply the title of *Lord*. The first Lord Napier was *Archibald*, eldest son of the illustrious inventor of the Logarithms.
- P. 309. col. 1. l. 8. For *paternas*, read *paternos*.
413. col. 2. line 26. For *Goetic*, read *Geotic*.
537. col. 2. l. 16. from bottom. For *CASIA*, read *CASSIA*.
651. in the Title of the Catalogue of Simples. For *method*, read *methods*.
652. col. 1. l. penult. Dele the parenthesis after *med*.
653. col. 1. l. 9. For *Sifon*, read *Sifon amomum*.
— col. 1. l. 13. For *con*. read *com*. or *communis*.
— col. 1. l. 17. For *arvensis*, read *A. arvensis*.
— foot-note, l. 4. For *antidyfenteria*, read *antidyfenterica*.
655. col. 1. l. 3. For *fistulous*, read *fistulosus*.
— col. 1. l. 20. For *balsaminum*, read *balsamita*.
— col. 1. l. 35. For *balsaminum*, read *balsamum*.
— col. 3. l. 11, 12, 13, 14, 15. For *rosin*, read *resin*.
656. col. 1. l. 31. For *Chenopidium*, read *Chenopodium*.
658. foot-note, l. penult. For *at*, read *as*.
661. col. 5. l. 21. For *nameo a*, read *name to a*.
665. col. 1. l. 16. 17. For *Fi- cureligiosa*, read *Ficu religiosa*.
— col. 1. l. 49. For *Fatidus*, read *H. fetidus*.
666. col. 1. l. penult. For *Psychatria*, read *Psychotria*.
677. col. 1. l. 9. 10. from bot. For *Da- turastramon*, read *Datura stramon.* or *stramonium*.
678. col. 1. l. 14. from bot. For *Verpascum*, read *Verbascum*.
— col. 5. l. 15. For *England*, read *Erland*.

N B. On account of the manner in which it was necessary to begin the ensuing Volume, the present one wants about 12 pages of the usual quantity, for which an equivalent shall be duly added in the next.

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29	PLATE XXIX.
30	PLATE XXX.

In all, 30 Plates.

PLATE I.

The first plate of the volume is a map of the British Empire, showing the extent of the British Empire in 1801. The map is divided into four parts, each representing a different part of the world. The first part shows the British Empire in Europe, the second part shows the British Empire in Asia, the third part shows the British Empire in Africa, and the fourth part shows the British Empire in America. The map is a valuable historical document, showing the extent of the British Empire at the beginning of the 19th century. The map is divided into four parts, each representing a different part of the world. The first part shows the British Empire in Europe, the second part shows the British Empire in Asia, the third part shows the British Empire in Africa, and the fourth part shows the British Empire in America. The map is a valuable historical document, showing the extent of the British Empire at the beginning of the 19th century.

On account of the manner in which it was necessary to begin the volume, the present one is not a complete history of the British Empire, but a history of the British Empire in 1801. The present one is a history of the British Empire in 1801, and not a history of the British Empire in 1801.

Herpes baited hook; the bait consisting of small roach or dace, and the hook fastened to one end of a strong line, made of silk and wire twisted together. To the other end of the line is fastened a stone of a pound weight; and several of these baited lines being sunk by means of the stone in different parts of the pond, in a night or two the heron will not fail of being taken by one or other of them.

HERPES, in medicine, a bilious pustule, which breaking out in different manners upon the skin, accordingly receives different denominations. See (the *Index* subjoined to) **MEDICINE**.

HERRERA TORDESILLAS (Anthony), a Spanish historian, was secretary to Vespasian Gonzaga viceroy of Naples, and afterwards historiographer of the Indies, under king Philip II. who allowed him a considerable pension. He wrote a general history of the Indies, in Spanish, from 1492 to 1554; and of the world (not so much esteemed), from 1554 to 1598. He died in 1625, aged about 66.

HERRERA (Ferdinand de), an eminent Spanish poet, of the 16th century, was born at Seville, and principally succeeded in the lyric kind. Besides his poems, he wrote notes on Garcilasso de la Vega, and an account of the war of Cyprus, and the battle of Lepanto, &c.

HERRING, in ichthyology, a species of **CLUPEA**. The name *herring* is derived from the German *beer*, an *army*, which expresses their number, when they migrate into our seas. Herrings are found in great plenty from the highest northern latitudes as low as the northern coasts of France. They are also met with in vast shoals on the coast of America, as low as Carolina: they are found also in the sea of Kamtschatka, and possibly reach Japan: but their winter rendezvous is within the arctic circle, whither they retire after spawning, and where they are provided with plenty of insect food. For an account of the remarkable migration of herrings, and the history of the fishery, &c. see **CLUPEA** and *Herring-Fishery*.

They are in full roe at the end of June, and continue in perfection till the beginning of winter, when they begin to deposite their spawn.

There are different names given to preserved herrings, according to the different manners wherein they are ordered: as, 1. *Sea-sticks*; which are such as are caught all the fishing season, and are but once packed. A barrel of these holds six or eight hundred; eight barrels go to the tun by law; a hundred of herrings is to be a hundred and twenty; a last is ten thousand, and they commonly reckon fourteen barrels to the last. 2. There are others, repacked on shore, called *repacked herrings*; seventeen barrels of sea-sticks commonly make from twelve to fourteen of repacked herrings. The manner of repacking them is, to take out the herrings, wash them out in their own pickle, and lay them orderly in a fresh barrel: these have no salt put to them, but are close packed, and headed up by a sworn cooper, with pickle, when the barrel is half full. The pickle is brine; so strong as that the herring will swim in it. 3. *Summers*, are such as the Dutch chasers or divers catch from June to the 15th of July. These are sold away in sea-sticks, to be spent presently, in regard of their fatness; because they will not endure repacking. They go one with another, full and shot

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ten; but the repacked herrings are sorted, the full herrings by themselves. 4. The *shotten* and *sick herrings* by themselves; the barrel whereof is to be marked distinctly. 5. *Crux herrings*; which are such as are caught after the 14th of September. These are cured with that kind of salt called salt upon salt, and are carefully sorted out, all full herrings, and used in the repacking. 6. *Corved herrings*. These serve to make red herrings, being such as are taken in the Yarmouth seas, from the end of August to the middle of October; provided they can be carried ashore within a week, more or less, after they are taken. These are never gipped, but rowed in salt, for the better preserving of them, till they can be brought on shore; and such as are kept to make *red-herrings* are washed in great vats in fresh water, before they are hung up in the *herring-hangs* or *red-herring* houses.

As for the *manner of salting herrings*. The nets being haled on board, the fishes are taken out, and put into the warbacks, which stand on one side of the vessels. When all the nets are thus unloaded, one fills the gippers baskets. The gippers cut their throats, take out their guts, and sling out the full herrings into one basket, and the *shotten* into another. One man takes the full basket when they are gipped, and carries them to the rower-back, wherein there is salt. One boy rows and stirs them about in the salt, and another takes them, thus rowed, and carries them in baskets to the packers. Four men pack the herrings into one barrel, and lay them, one by one, straight and even; and another man, when the barrel is full, takes it from the packers. It is left to stand a day, or more, open to settle, that the salt may melt and dissolve to pickle; after which it is filled up, and the barrel headed. The pickle is to be strong enough to sustain a herring; otherwise the fish decay in it.

HERRING (Thomas), archbishop of Canterbury, was the son of the rev. Mr John Herring, rector of Walsoken in Norfolk, where he was born in 1693. He was educated at Jesus-college, Cambridge; was afterwards chosen fellow of Corpus Christi College, and continued a tutor there upwards of seven years. Having entered into priest's orders in 1719, he was successively minister of Great Shelford, Stow cum Qui, and Trinity in Cambridge; chaplain to Dr Fleetwood, bishop of Ely; rector of Rettingdon in Essex, and of Barly in Hertfordshire; preacher to the Society of Lincoln's Inn, chaplain in ordinary to his late majesty, rector of Blechingly in Surry, and dean of Rochester. In 1737 he was consecrated bishop of Bangor, and in 1743 translated to the archiepiscopal see of York. On the death of Dr Potter in 1747, he was translated to the see of Canterbury; but in 1753 was seized with a violent fever, which brought him to the brink of the grave; and after languishing about four years, he died on the 13th of March 1757. He expended upwards of six thousand pounds in repairing and adorning the palaces of Croydon and Lambeth. This worthy prelate, in a most eminent degree, possessed the virtues of public life; his mind was filled with unaffected piety and benevolence, he was an excellent preacher, and a true friend to religious and civil liberty. After his death was published a volume of his sermons on public occasions.

HERRNHUT, or **HERRNHUTH**, the first and most considerable

Herrnhut

considerable settlement of the United Brethren, commonly called *Moravians*, situated in Upper Lusatia, upon an estate belonging to the family of Nicolas Lewis Count Zinzendorf, about 50 miles east of Dresden. See the article *UNITED Brethren*.

The building of this place was begun in 1727 by some emigrants from Moravia, who forsook their possessions on account of the persecution they suffered as Protestants from the Roman Catholics; and being well received by Count Zinzendorf, cleared a spot of ground allotted to them by him upon the rise of an hill called the *Hutberg*, or Watch-hill, from which they took occasion to call the new settlement *Herrnhut*, or the Watch of the Lord. More emigrants taking refuge with them, and many other persons joining their congregation, the buildings increased considerably; and at present Herrnhut is a regular and well built village, containing about 1300 inhabitants, all members of the Church of the United Brethren. Besides the minister and his assistants, a warden is appointed, who presides in the vestry, and superintends the temporal concerns of the settlement. The Brethren distinguish themselves by a plain and uniform dress, the women having retained the dress of the countries from which the first emigrants proceeded, not from any superstitious attachment to old forms, but from a desire to preclude vanity and useless expence. As most of the settlements of this community resemble each other, both in the disposition of their buildings and in their internal regulations, we will give a short sketch of Herrnhut, as the pattern from which the rest were copied, though there are others in which the buildings are more regularly planned. The chapel, which is situated in a large square, is a spacious and neat building, furnished with a good organ and moveable forms, but no pews. The men sit on one side, and the women on the other, entering at separate doors. Besides the usual Sunday's service, the congregation meets here every evening and the children every morning. The dwellings of the minister and warden of the congregation form one, and a school-house the other, wing to the chapel. From the chapel an avenue of trees leads to the burying-ground, which is a large square field on the declivity of the *Hutberg*, and at some distance from the village. Several walks bordered by trees, and furnished with seats, surround and intersect it. The grave-stones and graves are all of equal size, and placed in regular rows; only the vault of Count Zinzendorf, as lord of the manor, is larger than the rest. Burials are performed with great solemnity, but no mourning dresses used.—On one side of the square, in which the chapel stands, is a large building, inhabited by the single men, with workshops, out-houses, and gardens, exclusive of the dwelling rooms. The main building contains a neat chapel, in which a short morning and evening service is performed for the inhabitants; a dining-hall; and a dormitory, in which each has a separate bed. The latter is a lofty room, furnished with large windows and ventilators, so as to admit and preserve a pure air. For the sick, apartments are allotted, and sick waiters appointed. The number of inhabitants in one room is proportioned to its size, but there are many who have rooms to themselves. No one lives here by compulsion. Each in-

habitant pays for rent and board a moderate sum, fixed by a committee of overseers, in which the warden of the house presides; whose business it is to maintain good order, attend to the external welfare of the house and its inhabitants, and by his advice and activity to prevent every evil arising from external sources. Besides the warden, an unmarried clergyman resides in the house, appointed to attend to the moral conduct and spiritual concerns of all the single men belonging to the congregation. He hears their complaints, assists them with good advice, and uses all his influence for their benefit, and for the prevention of any evil that would undermine their spiritual happiness.—On the other side of the square is another large building, inhabited by single women; with a chapel, dining hall, dormitory, and a large garden. The internal regulations are exactly the same with those of the house of the single men. There are likewise houses for widowers and widows, who find in them an agreeable retreat, with board and lodging. The poor are cared for and maintained; for which purpose several charitable institutions exist in the congregation.—The manor-house, the house of Count Reufs, the shop and linen warehouses, are the most considerable buildings in Herrnhut; the family houses are built in regular streets, opening into the square. Both the streets and houses are kept clean; and besides a watchman at night, an officer is appointed to attend to good order in the day. All strangers are treated with civility; but neither drunken nor disorderly visitors nor beggars are suffered to infest the streets. The latter receive an alms, and are then desired to proceed. The principal trade carried on at Herrnhut is in linen; besides which the work done there by tailors, glovers, shoemakers, cabinet-makers, silversmiths, and other artificers, is well known for its good quality. They have their first prices, and never make any abatement. Every workman receives his wages; no community of goods existing among the brethren, as is falsely supposed; and the contributions towards the support of the establishment at large, the missions, and other charitable institutions, are voluntary. The building and increase of this settlement occasioned no small surprise in the adjacent country; and both in 1732, 1736, and 1737, commissioners were appointed to examine into the doctrines and proceedings of the brethren at Herrnhut. The commissioners made a favourable report; and ever since both Herrnhut and other settlements of the United Brethren in Saxony have been protected, and even several immunities offered them by the court, but not accepted. Herrnhut was visited in 1766 by the late Emperor Joseph II. after his return from Dresden, by the present king of Prussia, and by several other royal personages, who expressed their satisfaction in examining its peculiar regulations. The United Brethren have settlements in Saxony, Silesia, and other parts of Germany; in Holland, Denmark, England, Ireland, and America. In England, their principal settlements are at Fulnec near Leeds, and Fairfield near Manchester. In Greenland, North and South America, the West Indies, and Russia, they have missions for the propagation of Christianity among the heathen; and in many parts have had considerable success. See *Busching's Account of the Rise and Progress of*

Herrnhut.

Herrnhut, of the Church of the Brethren, Halle 1781; and **Heise**. *Grantz's History of the Brethren*, London 1780.

HERRNHUT (*New*), the first mission settlement of the United Brethren in the island of St Thomas in the West Indies, under Danish government, begun in 1739; their missionaries having endeavoured to propagate Christianity among the negro slaves ever since 1731, and suffered many hardships and persecutions, from which their converts were not exempted. Many of the planters finding in process of time that the Christian slaves were more tractable, moral, and industrious than the heathen, not only countenanced but encouraged their endeavours. These were also greatly facilitated by the protection of the king of Denmark, Christian VI. The settlement consists of a spacious negro church, a dwelling-house for the missionaries, negro huts, out-houses, and gardens. From this place the islands of St Croix and St Jan were at first supplied with missionaries; and the Brethren have now two settlements in each. The negro converts belonging to their church amount in those three islands to near 8000 souls.

HERRNHUT (*New*), is also the name of the oldest mission settlement of the United Brethren in Greenland. It is situated on Balls River, a few miles from the sea, near Davis's Straights, on the western coast of Greenland, not far from the Danish colony Godhaab. The two first missionaries were sent from Herrnhut in the year 1733, and their laudable intentions favoured by Christian VI. king of Denmark. They had to struggle in this uncultivated, frozen, and savage country, with inconceivable hardships, and found at first great difficulty in acquiring the language of the natives. However, after six years labour and perseverance, they had the satisfaction to baptize four persons, all of one family; and from that time the mission began to prosper, so that in the succeeding years two other settlements were begun, called Lichtenfels and Lichtenau: All of them continue in prosperity. About 1300 of the natives have been christianized since the beginning of this mission. See *Grantz's History of Greenland*, London, 1777.

HERSE, in fortification, a lattice, or porcellis, in form of an harrow, beset with iron spikes. The word *herse* is French, and literally signifies "harrow;" being formed of the Latin *herpex* or *irpex*, which denotes the same. It is usually hung by a rope fastened to a moulinet; to be cut, in case of surprise, or when the first gate is broken with a petard, that the herse may fall, and stop up the passage of the gate or other entrance of a fortress.

The herse is otherwise called a *sarrafin*, or *cataract*; and when it consists of straight stakes, without any cross-pieces, it is called *orgues*.

HERSE, is also a harrow, which the besieged, for want of chevaux de frise, lay in the way, or in breaches, with the points up, to incommode the march as well of the horse as of the infantry.

HERSILLON, in the military art, a sort of plank or beam, ten or twelve feet long, whose two sides are drove full of spikes or nails, to incommode the march of the infantry or cavalry. The word is a diminutive of *herse*; the herfillon doing the office of a little herse. See **HERSE**.

HERTFORD. See **HARTFORD**.

HERTHA, or **HERTHUS**, in mythology, a deity

worshipped by the ancient Germans. This is mentioned by Tacitus, in his book *De Moribus Germanorum*, cap. 40: Vossius conjectures, that this goddess was Cybele: but she was more probably Terra or the Earth; because the Germans still use the word *bert* for the earth, whence also the English *earth*.

HERTZBERG, a considerable town of Germany, in the electorate of Saxony, and on the confines of Lusatia. E. Long. 13. 37. N. Lat. 51. 42.

HERVEY (James), a late divine of exemplary piety, was born in 1714, and succeeded his father in the livings of Weston Favell and Collingtree in Northamptonshire. These being within five miles of each other, he attended alternately with his curate; till being confined by his ill health, he resided constantly at Weston; where he diligently pursued the labours of the ministry and his study, under the disadvantage of a weak constitution. He was remarkably charitable; and desired to die just even with the world, and to be, as he termed it, his own executor. This excellent divine died on Christmas-day 1758, leaving the little he possessed to buy warm cloathing for the poor in that severe season.—No work is more generally or deservedly known than his *Meditations and Contemplations*: containing, Meditations among the Tombs, Reflections on a Flower-garden, a Descant on Creation, Contemplations on the Night and Starry Heavens, and a Winter-piece. The sublime sentiments in these pieces have the peculiar advantage of being conveyed in a flowing elegant language, and they have accordingly gone thro' many editions. He published besides, *Remarks on Lord Bolingbroke's Letters on History*; *Theron and Aspasio*, or *a Series of Dialogues and Letters on the most important subjects*; some sermons, and other tracts.

HERVEY Island, one of the South-Sea islands discovered by Captain Cook, September 23. 1773, who gave it that name in honour of the earl of Bristol. It is a low island, situated in W. Long. 158. 54. S. Lat. 19. 8.

HESBON, **ESEBON**, or *Hesbon* (anc. geog.), the royal city of the Amorites, in the tribe of Reuben, according to Moses: Though in Joshua xxi. 39. where it is reckoned among the Levitical cities, it is put in the tribe of Gad; which argues its situation to be on the confines of both.

HESIOD, a very ancient Greek poet; but whether cotemporary with Homer, or a little older or younger than him, is not yet agreed among the learned; nor is there light enough in antiquity to settle the matter exactly. His father, as he tells us in his *Opera et Dies*, was an inhabitant of Cuma, one of the Eolian isles, now called *Taio Nova*; and removed from thence to Ascra, a little village of Bœotia, at the foot of mount Helicon, where Hesiod was probably born, and called, as he often is, *Ascreus*, from it. Of what quality his father was, is nowhere said; but that he was driven by his misfortunes from Cumæ to Ascra, Hesiod himself informs us. His father seems to have prospered better at Ascra than he did in his own country; yet Hesiod could arrive at no higher fortune than keeping sheep on the top of mount Helicon. Here the muses met with him, and entered him into their service:

Erewhile as they the shepherd swain behold,
Feeding beneath the sacred mount his fold,
With love of charming song his breast they fir'd,
There met the heav'nly muses first inspir'd;
There, when the maids of Jove the silence broke,
To Hesiod thus, the shepherd swain they spoke, &c.

Hersillon

||
Hesiod.

Hesiod
||
Hesperides

To this account, which is to be found in the beginning of his *Generatio Deorum*, Ovid alludes in these two lines:

Nec mihi sunt visa Clio, Cliusque sorores,

Servanti pecudes vallibus Ascræ tuis.

Nor Clio nor her sisters have I seen,

As Hesiod saw them in the Ascræan green.

On the death of the father, an estate was left, which ought to have been equally divided between the two brothers Hesiod and Perses; but Perses defrauded him in the division, by corrupting the judges. Hesiod was so far from resenting this injustice, that he expresses a concern for those mistaken mortals who place their happiness in riches only, even at the expence of their virtue. He lets us know, that he was not only above want, but capable of assisting his brother in time of need; which he often did though he had been so ill used by him. The last circumstance he mentions relating to himself is his conquest in a poetical contention. Archidamus, king of Eubœa, had instituted funeral games in honour of his own memory, which his sons afterwards took care to have performed. Here Hesiod was a competitor for the prize in poetry; and won a tripod, which he consecrated to the muses. Hesiod having entered himself in the service of the muses, left off the pastoral life, and applied himself to the study of arts and learning. When he was grown old, for it is agreed by all that he lived to a very great age, he removed to Locris, a town about the same distance from mount Parnassus as Ascræa was from Helicon. His death was tragical. The man with whom he lived at Locris, a Milesian born, ravished a maid in the same house; and though Hesiod was entirely ignorant of the fact, yet being maliciously accused to her brothers as an accomplice, he was injuriously slain with the ravisher, and thrown into the sea. The *Theogony*, and *Works and Days*, are the only undoubted pieces of this poet now extant: though it is supposed that these poems have not descended perfect and finished to the present time. A good edition of Hesiod's works was published by Mr Le Clerc at Amsterdam in 1701.

HESPER, HESPERUS, in astronomy, the evening star; an appellation given to Venus when she follows or sets after the sun. The word is formed of the Greek *Εσπερος*; and is supposed to have been originally the proper name of a man, brother of Atlas, and father of the Hesperides.

Diodorus, lib. iii. relates, that Hesperus having ascended to the top of mount Atlas, the better to observe and contemplate the stars, never returned more; and that hence he was fabled to have been changed into this star.

HESPERIA, an ancient name of Italy; so called by the Greeks from its western situation. *Hesperia* was also an appellation of Spain; but with the epithet *ultima* (Hor.), to distinguish it from Italy, which is called *Hesperia magna* (Virg.), from its extent of empire.

HESPERI CORNU, called the *Great Bay* by the author of Hanno's Periplus; but most interpreters, following Mela, understand a promontory; some Cape Verd, others Palmas Cape: Vossius takes it to be the former, since Hanno did not proceed so far as the latter cape.

HESPERIDEÆ, in botany (from the Hesperides); *golden or precious fruit*: the name of the 19th order in Linnæus's *Fragments of a Natural Method*. See BOTANY, p. 461.

Hesperides
||
Hesperis.

HESPERIDES, in the ancient mythology, were the daughters of Hesper or Hesperus, the brother of Atlas. According to Diodorus, Hesperus and Atlas, two brothers who possessed great riches in the western parts of Africa. Hesperus had a daughter called Hesperia, who married her uncle Atlas, and from this marriage proceeded seven daughters, called *Hesperides* from the name of their mother, and *Atlantides* from that of their father. According to the poets, the *Hesperides* were three in number, Ægle, Arethusa, and Hesperthusa. Hesiod, in his *Theogony*, makes them the daughters of Nox, Night, and seats them in the same place with the Gorgons; viz. at the extremities of the west, near mount Atlas: it is on that account he makes them the daughters of Night, because the sun sets there. The Hesperides are represented by the ancients as having the keeping of certain golden apples, on the other side the ocean. And the poets give them a dragon to watch the garden where the fruit grows: this dragon they tell us Hercules slew, and carried off the apples.—Pliny and Solinus will have the dragon to be no other than an arm of the sea, wherewith the garden was encompassed, and which defended the entrance thereof. And Varro supposes, that the golden apples were nothing but sheep. Others, with more probability, say they were oranges.

The *Gardens of the HESPERIDES* are placed by some authors at Larach, a city of Fez; by others, at Bernich a city of Barca, which tallies better with the fable. Others take the province of Susa in Morocco for the island wherein the garden was seated. And, lastly, Rudbecks places the Fortunate Islands, and the gardens of the Hesperides, in his own country Sweden.

HESPERIDUM INSULÆ (anc. geog.), islands near the Hesperic Cornu; but the accounts of them are so much involved in fable, that nothing certain can be affirmed of them.

HESPERIS, ROCKET, *Dame's Violet*, or *queen's gilliflower*: A genus of the filiquosa order, belonging to the tetradynamia class of plants; and in the natural method ranking under the 39th order, *Siliquosæ*. The petals are turned obliquely; there is a glandule within the shorter stamina; the siliqua almost upright; the stigma forked at the base, connivent, or closing at the top; the calyx close.

Species 1. The matronalis, or common sweet-scented garden rocket, hath fibrous roots, crowned with a tuft of long, spear-shaped, rough leaves; upright, single, hairy stalks, two feet high; garnished with oval lanceolate, slightly indented, close-fitting leaves; and the stalk and branches terminated by large and long spikes of sweet-scented flowers of different colours and properties in the varieties, of which there are a great number. All the varieties of this species are so remarkable for imparting a fragrant odour, that the ladies were fond of having them in their apartments. Hence they derived the name of *dame's violet*; and, bearing some resemblance to a stock-gilliflower, were sometimes also called *queen's gilliflower*; but are now most commonly called *rocket*.

2. The inodora, or scentless rocket, hath a fibrous root; upright, round, firm stalks, two feet high, garnished with spear-shaped, acute-pointed, sharply indented, close-fitting, leaves; and all the branches terminated by large spikes of scentless flowers, with obtuse petals, of different colours and properties in the varieties. This species makes

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